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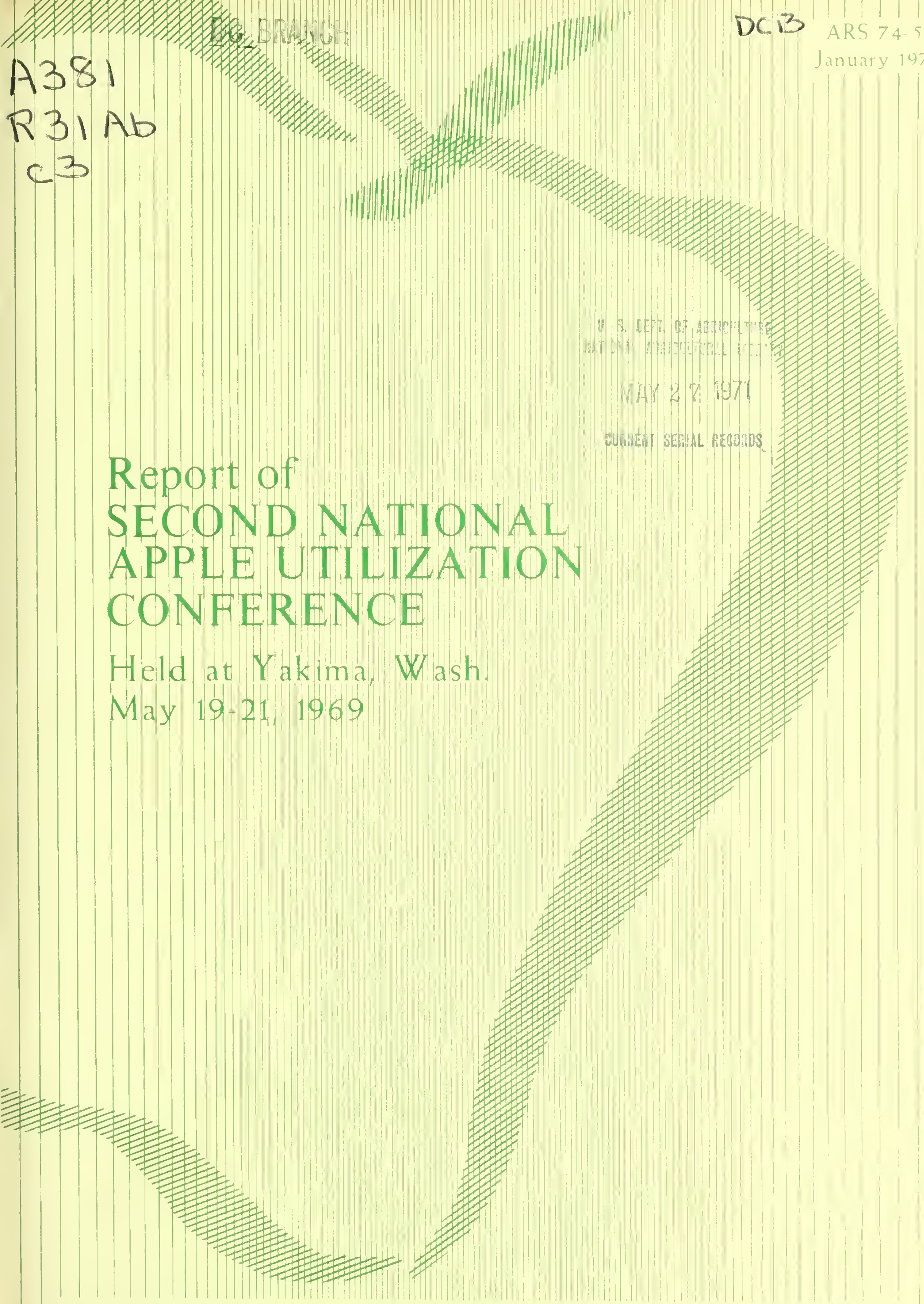

Report of
SECOND NATIONAL APPLE UTILIZATION CONFERENCE

Held at Yakima, Wash.
May 19-21, 1969

Agricultural Research Service UNITED STATES DEPARTMENT OF AGRICULTURE

THE SECOND NATIONAL APPLE UTILIZATION CONFERENCE was held May 19-21, 1969, at Yakima, Washington. It was attended by apple growers, shippers, and processors as well as by research and extension workers from State and Federal agencies.

As part of the program, interested participants toured apple packing and processing plants in the Yakima Valley on May 19.

Sponsors of this Conference were:

Washington State University:
Departments of Horticulture and
Agricultural Economics, and the
Cooperative Extension Service

United States Department of Agriculture
Western Utilization Research and
Development Division

in cooperation with

National Apple Institute
International Apple Association
Processed Apples Institute
Washington State Apple Commission
Washington State Horticultural Association
Federal Extension Service

Statements made by participants are their own and do not necessarily represent views of the U.S. Department of Agriculture. Underscored numbers in parentheses refer to references at the end of each paper. References, figures, and tables are reproduced essentially as they were supplied by the speakers. Mention of commercial products does not imply recommendation or endorsement by the U.S. Department of Agriculture over others not mentioned.

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REPORT OF SECOND NATIONAL APPLE UTILIZATION CONFERENCE

TREE COUNT, APPLE PRODUCTION AND UTILIZATION--FRESH AND PROCESSED

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I view my assignment as one of setting the stage for more detailed discussion of this topic by the speakers who will follow. In the time I have, I can only paint a broad picture of those factors of vital interest to members of the national apple industry. Three years ago at the first national conference of this type I presented information on a similar topic. Some of the trends I discussed there must be re-examined if we are to gain insight as to what is ahead for the apple industry as a whole as well as the regional parts which compose this industry.

Most of this analysis begins with 1934, the first year that estimates of commercial apple production were reported. At least two points are important as we consider total apple production in the United States (fig. 1):

1. The trend in production was down from 1934 to the late 1940's; then it was reversed, and production increased through 1964 when a total of 139 million bushels were harvested. Since that season each year has brought about a smaller crop; the crop last season was the smallest since 1960.

2. The annual year-to-year variation in production was much sharper from 1934 to 1950 than from 1950 to date. During the first period, the year-to-year variation averaged 32 percent, while during the latter period it averaged only 8 percent. Since 1961, a period of 7 years, the annual variation has averaged less than 4 percent. Whether this kind of stability will continue is extremely difficult to forecast.

While the national crop was stable, some big year-to-year changes occurred in the different apple producing regions (fig. 2). For example, the Eastern crop varied as much as 25 percent from one season to the next. Production in the Central States varied as much as 38 percent while in the Western producing area, annual

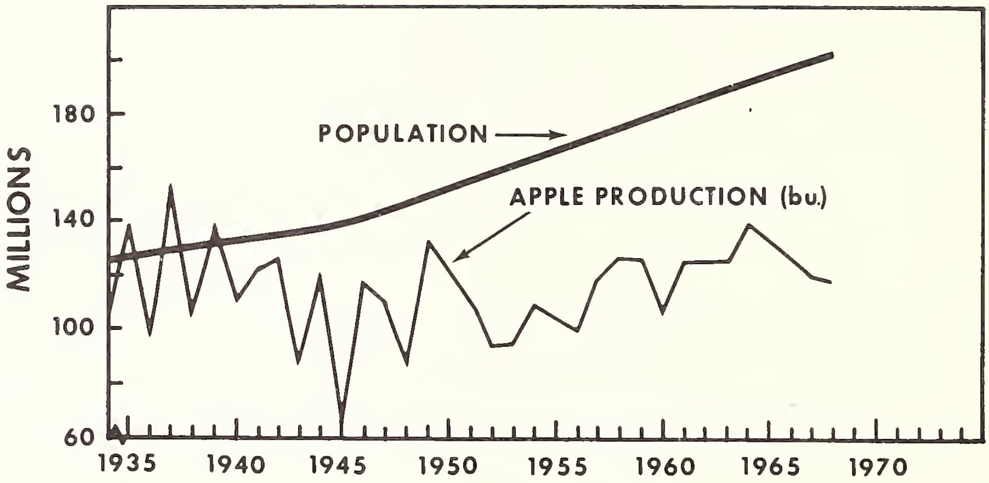


Figure 1.--Total apple production and population in the United States.

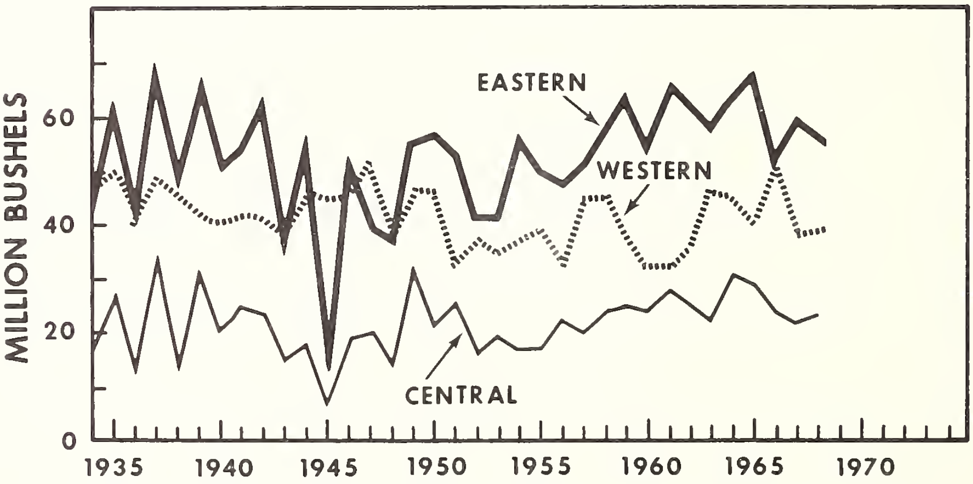


Figure 2.--Total apple production in the United States by regions.

variation in production moved as much as 27 percent. This suggests that the industry has been quite fortunate not to have had wide annual swings in national apple production.

At the same time, one measure of market potential, population, has been increasing at such a rate (fig. 1) that population in millions of people is compared with apple production in terms of millions of bushels. From the early 1950's through 1964, the trend in each variable was upward, and in 1966 I indicated that they were in a real horse race. Since that time, apple production has fallen behind in the race, so apple production per person has declined.

At the utilization conference in 1966, I also indicated that projecting (not forecasting) the trend in each of these variables showed that apple production would increase faster than population. At that time the trend seemed to point to an increasing number of pounds of apples produced per person. I don't know of any basic changes that have occurred in the industry to modify this prediction even though national crops during the last 4 years have not followed the general trend. At the 1966 meeting, I pointed out that even though the level of apple production may not increase much faster than population, production will be considerably ahead of population during some years at least, and serious industry problems will exist unless some coordinated action is taken by the industry to avoid it. A real big crop in a given year is still possible and should be of at least as much concern to the industry as the general level of apple production. But that's a topic for another talk which I am not scheduled to give here.

Let's look at trends in apple production in different areas of the country. In the East, a rather sharp upward trend in production took place between the middle 1940's through 1965. Production during the last 3 years has been below the trend line. However, I believe the upward trend in production in the East will continue but most likely not so steeply as from the mid-1940's through 1965. A modest-to-sharp upward trend was apparent in the Central States from the middle 1940's until 1965. I believe this upward trend will be resumed and perhaps become even steeper. But as was true in the Eastern States, production has been below the trend line since 1965. In the Western States, a slight downward trend in production existed between 1934 and 1950. Since then, the production level appears to have been about constant or perhaps modestly increasing. I believe that a sharp increase in production will occur in the West as young trees come into greater production.

It is clear that we cannot just project past production trends in deciding what the future holds for apple production in each region of the country or, for that matter, nationally. The only way I know to make some meaningful statements about the level of apple production is to examine the factors which make up production, namely, number of bearing trees and yield per tree.

The latest information available on a national basis comes from the 1964 Census (table 1). In the Eastern States in 1964, 25 percent of the total trees were nonbearing. A continuation of this level of planting may about maintain the 8.7 million bearing trees which existed in 1964. In the Central States the level of planting of young trees was slightly higher--28 percent non-bearing--and would just about maintain the 5.1 million bearing trees that existed in 1964 in that area. In the Western States, with 32 percent of all trees nonbearing in 1964, the total of 7.2 million bearing trees will likely show some increase by the time the 1969 Census data are available. We will have to wait until those data are available before we can tell the number of apple trees in the different areas of the country and the national total. We cannot get this information accurately from the state surveys of commercial orchards.

TABLE 1.--Number of bearing and nonbearing apple trees in the United States by area

Area	Number of bearing trees		Nonbearing trees: Number		Nonbearing trees: Percent of total trees	
	1959	1964	1959	1964	1959	1964
	Millions					
Eastern	9.0	8.7	2.8	2.9	24	25
Central	5.5	5.1	2.0	2.0	27	28
Western	5.2	7.2	3.6	3.3	41	32
Other[1]	.6	.4	.3	.3	31	43
U.S. Total	20.3	21.4	8.7	8.5	30	28

[1] States other than commercial apple producing states.

Source: U.S. Census (Preliminary).

The latest data on yield per tree are for the period 1960-64 (table 2). You can see the differences over time among the important apple producing regions of the country. During the 1960-64 period, the average yield per bearing tree had increased over earlier periods in each major apple producing region except Washington. Average yield per bearing tree in Washington declined from 9.3 bushels in 1955-59 to an average of 6.7 bushels per bearing tree in 1960-64. There were reasons for

TABLE 2.--Estimated yield of apples per bearing tree in selected States and areas[1]

Period	New York	New England	Appalachia	Michigan	Washington	California	U.S.
	Bushels per tree						
1940-44	3.0	2.6	2.0	1.8	8.5	3.7	2.2
1945-49	2.9	2.4	2.0	2.0	10.6	5.2	2.5
1950-54	4.5	3.7	3.1	3.0	9.0	5.2	3.2
1955-59	6.4	6.0	4.8	4.7	9.3	5.0	4.9
1960-64	8.4	7.7	6.2	6.1	6.7	7.4	6.0

[1] Yields computed assuming constant annual changes in bearing tree numbers between census years.

Source: USDA Crop Production and U.S. Census.

this. No State in the nation increased the number of bearing trees from 1959 to 1964 like this State; the number went from 2.6 million to 4.1 million, an increase of 60 percent. This took place while the nation as a whole increased from 20.3 million to 21.4 million or only 5 percent. Many of the trees in Washington State had certainly not reached their peak of bearing by 1960-64. This fact combined with the introduction of trees less-than-standard in size combined to reduce yield per tree.

To give further interpretation to average yield per bearing tree in the commercial apple producing regions, we must look at the profile of apple trees by age (table 3). In Washington,

TABLE 3.--Profile of apple tree age--Central Washington, Appalachian States, New England States, and New York, 1966

Year planted	Tree age	Central Washington	Appalachian States[1]	New England[2]	New York
	Years	Percent of total			
Before 1940	27	16	19	54	37
1940-49	17-26	6	21		17
1950-54	12-16	10	14	9	9
1955-59	7-11	34	18	12	13
1960-62	4-6	15	12	13	10
1963-64	2-3	11	12	8	9
1965	1	8	4	4	5
Total		100	100	100	100

[1] New Jersey, Pennsylvania, Maryland, Delaware, Virginia, and West Virginia. [2] Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

Source: E. C. Wilcox and A. H. Harrington, "Central Washington Fruit Tree Census, 1966," Wash. Agr. Exp. Sta. Cir. 495, Nov. 1968; 1967 Regional Summary of Fruit Tree Surveys, Selected Appalachian States, SRS-13, Statistical Reporting Service, U.S. Dept. Agr., July 1968.

34 percent of the trees are less than 7 years old. Only 16 percent are over 26 years old. This percentage distribution was changed this winter, and it will be some time before the actual distribution will be known. The greatest contrasts with this are in New York and New England where sizable proportions of the trees are older.

In New York, 37 percent of the trees are 27 years or older. I don't have a breakdown for New England but it's probably closer to the New York profile than the one in Washington State. The Appalachian area is in between these two extremes. These data indicate that the Washington apple industry is substantially different from other areas of the country in percentage distribution of trees by age groups. The exact magnitude of the increase in production here based on this distribution of trees cannot be predicted with any great precision. The potential, however, is real and substantial. No other area in the country can match it.

We have looked at production, tree numbers, yield per tree, and tree age profile. Now I turn to trends in utilization of the apple crop and then to varieties. The trend in use of apples for fresh market from 1934 to about 1955 is definitely down (fig. 3). The sale of apples for fresh use increased from then until 1964 and has since declined. However, the level is still above the 1950 to 1956 period. On the other hand the use of apples for processing began to move up in the middle 1950's

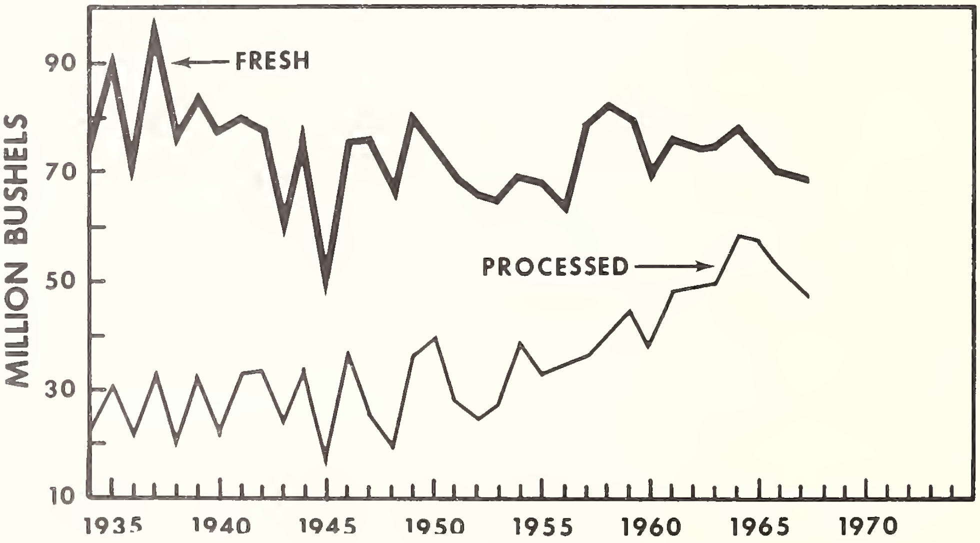
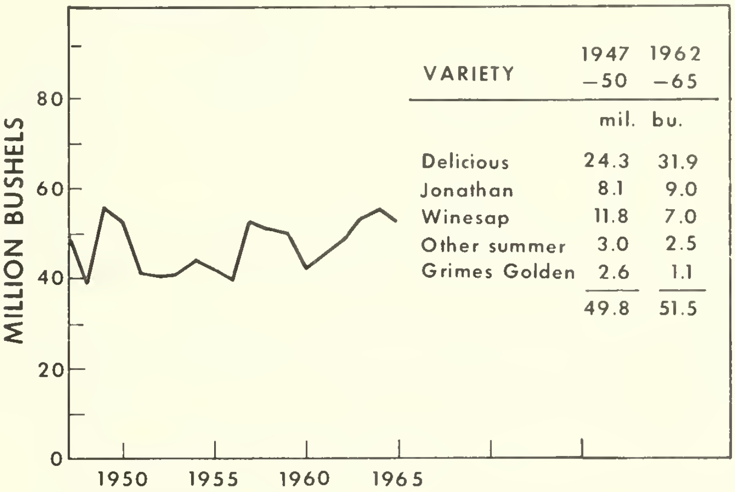


Figure 3.--Utilization of apple sales in the United States.

at a rapid rate and continued until 1964. Since then, processed use has declined at a rate somewhat faster than apples for fresh use. It is difficult to explain these trends, except that there have been fewer apples available for fresh and processed use since 1964.

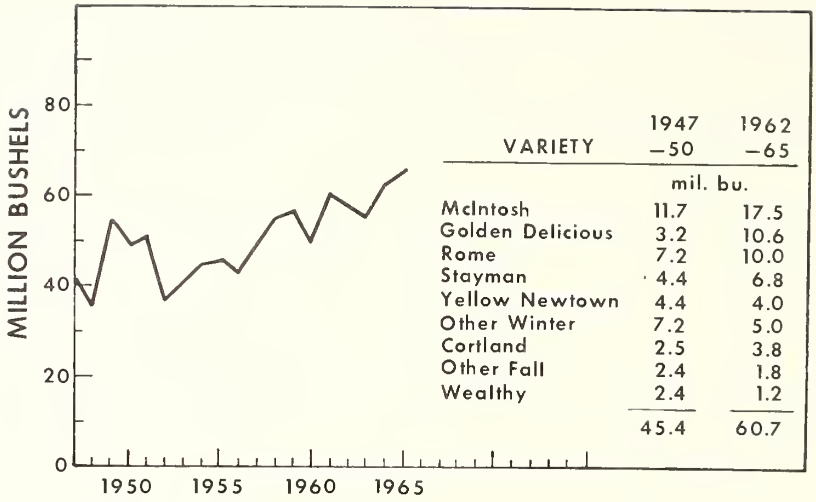
Now, let's look at the trend in the production of different groups of apple varieties (fig. 4). Because of the change in method of reporting production by variety in terms of pounds and not bushels, it is not possible to present data for the last 3 years and go back very far in time to show changes. I believe you know the basic trends. Among the varieties I have classified as fresh--Delicious, Jonathan, Winesap, Grimes Golden, and Other Summer--the only one on the increase substantially in tree numbers is Delicious and you know this story. In every major area of the country except New England, it is the leading variety in young plantings. Jonathan is about being maintained in Central States but Winesap is going down quite rapidly in Washington but is being maintained in the Appalachian area.



VARIETY	1947 -50	1962 -65
	mil.	bu.
Delicious	24.3	31.9
Jonathan	8.1	9.0
Winesap	11.8	7.0
Other summer	3.0	2.5
Grimes Golden	2.6	1.1
	49.8	51.5

Figure 4.--Total production of "fresh" apple varieties in the United States, 1947-1965.

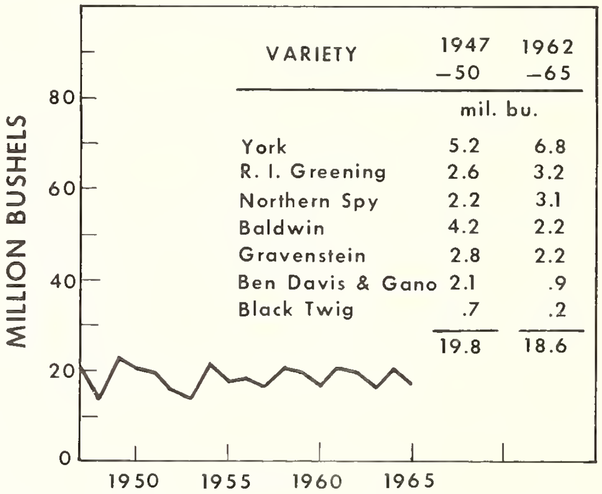
I have classified McIntosh, Golden Delicious, Rome, Stayman, Yellow Newtown, Other Winter, Cortland, Other Fall, and Wealthy as "dual purpose." These varieties have shown considerable growth over the past 20 years, but the only one of these where substantial future growth is likely is Golden Delicious (fig. 5). Bearing McIntosh trees are about being maintained in New England and the Central States. Rome is more than being maintained in the Central States.



VARIETY	1947 –50	1962 –65
	mil. bu.	
McIntosh	11.7	17.5
Golden Delicious	3.2	10.6
Rome	7.2	10.0
Stayman	4.4	6.8
Yellow Newtown	4.4	4.0
Other Winter	7.2	5.0
Cortland	2.5	3.8
Other Fall	2.4	1.8
Wealthy	2.4	1.2
	45.4	60.7

Figure 5.--Total production of "dual purpose" apple varieties in the United States, 1947-1965.

Recent state surveys of tree numbers show that no major traditional processing variety is being replanted in enough volume to increase the number of bearing trees very much (fig. 6). York is barely being maintained in the Appalachian area. However, there are a number of newer varieties coming along to make up perhaps some of this loss in production potential. It is difficult to measure the magnitude of this change, however, from the state surveys which have been made.



VARIETY	1947 –50	1962 –65
	mil. bu.	
York	5.2	6.8
R. I. Greening	2.6	3.2
Northern Spy	2.2	3.1
Baldwin	4.2	2.2
Gravenstein	2.8	2.2
Ben Davis & Gano	2.1	.9
Black Twig	.7	.2
	19.8	18.6

Figure 6.--Total production of "processing" apple varieties in the United States, 1947-1965.

There are a number of problems involved in making an analysis such as I have presented. First is the change to reporting apple production, utilization, and varietal composition in pounds rather than bushels. It is impossible to convert data for the last few years to comparable bushels reported in the earlier period--at least before 1959. The procedure of reporting in pounds is sound, but it will require some research to make recent data comparable with earlier years.

Data from State surveys are helpful in showing trends, particularly in varieties, but the problems of the less-than-standard-size tree and how to measure and interpret the yields over time require more attention. These dwarf and semidwarf trees are becoming so important in young plantings that we must find a way to determine the influence of this type of tree on the level of apple production in the future.

In addition, without acreage figures on size-controlled trees, it is impossible to tell what the planting rates are per acre. Only a few State surveys have these, and there are some real variations. In one State, dwarf and semidwarf average only 61 trees per acre, or less than the usual planting rate for standard trees in Washington. For standard trees in that State, the average is only 36 trees per acre. What these actual spacings are in each of the States has tremendous implications to the industry in terms of yields and costs per acre. Also, there still exists a great difference between the average spacing of standard trees in the West and in the East. Without acreage figures on different types of trees, tree numbers cannot have their full meaning.

Data on apple tree numbers, production, and utilization at this time can only be indicators of trends for the future. However, I trust that my analysis has given you some insights of value.

CHANGES IN WORLD PRODUCTION AND TRADE PATTERNS FOR APPLES

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Washington, D.C.

My assignment here today is to review recent trends in apple production around the world and how these are affecting the patterns of trade. In exploring background for my paper, country by country, I soon realized that covering the world in the time allotted to me would be most ambitious. The complexion of apple production in a large number of countries--from the standpoint of orchard modernization and varietal composition--has changed or is changing dramatically. Each in itself would make an interesting subject. However, after putting all of the pieces together, I was confronted with the inescapable conclusion that we are today indeed in a pivotal marketing era.

One country in particular transcends all others in providing the break with the past. This country is France. Its fantastic rise in production within a very short span of time and its almost simultaneous emergence as a world exporter of high prominence have injected considerable concern and challenges anew to the more traditional exporting countries who too have enlarged their production plant. Because of its already apparent disruption to international trade patterns, a large part of my presentation will necessarily center around France.

The world production of apples is definitely expansionary. Throughout the 1950's and extending into the early 1960's, plantings were exceptionally heavy in virtually every corner of the globe--whether it be Europe, Africa, the Middle East, the Far East, the Americas or Oceania. These plantings are now being mirrored in production gains--and sizable gains at that!

According to our measurements, world apple production over the past four seasons, 1964-67, has averaged slightly over 900 million bushels. This marks an increase of 200 million bushels or almost 30 percent over the average of the second half of the 1950's, 1956-59.

I will now review briefly the trends within each of the major producing regions. Turning first to Western Europe--an area which in the past served as a most valuable market for the United States, Canada, and other distant suppliers--we find not only has production increased dramatically but it now appears to be rapidly approaching a high degree of self-sufficiency from within.

Here, the spotlight must necessarily fall on France. Though production gains have been highly significant elsewhere in Europe, the production explosion in France is without equal. During the latter half of the 1950's, the French dessert apple crop averaged about 20 million bushels. Today, it is in the neighborhood of 70 million bushels--a 3-1/2-fold increase.

Despite weather setbacks, the momentum of French plantings coming into production has been so great that each year since 1959 has seen, without interruption, a steady increase in the French crop. Its average rate of growth since 1960 has been about 11 percent per annum.

On the basis of numerous projections, it is apparent that we have not yet by any means witnessed a full realization of the French potential. For example, a projection recently published by Organization for Economic Cooperation and Development suggested that by 1970, France would be producing in the vicinity of 85 million bushels. Despite the fact that this is only one year away, experience of the recent past certainly suggests that realization of the projection is entirely within the realm of probability.

Examination of the varietal composition of the French crop immediately brings forth the astonishing prominence of one variety, the Golden Delicious. In 1967, this variety alone accounted for 54 percent of the total French crop. And, on the basis of an early forecast for the 1968 harvest, the Golden Delicious was destined to command about 63 percent of the total. In quantitative terms, this would represent an equivalent of about 46 million bushels of Golden Delicious alone. In the United States, this past season, we produced only about 13 million bushels of Golden Delicious.

Let me leave France for the moment and comment on what has happened to production elsewhere in the world. Inasmuch as I must also cover the shifting patterns of international trade in this talk, I will, in the interest of brevity, merely cite the percentage changes in production for some of the more important producing countries. I will do this by comparing the average of the pre-1960 base period of 1956-59 with the average of the four most recent completed seasons, 1964-67. Looking first to the balance of Western Europe (other than France), we find the following percentage increases:

	Pct. increase
Italy	51
Belgium	17
Netherlands	45
West Germany	37
Greece	93
Switzerland	18
Spain	56

Turning to Eastern Europe, we find much the same story. Hungary is up 63 percent; Bulgaria, 53 percent; Romania, 42 percent; Poland, 78 percent; and Yugoslavia, 13 percent.

And in the Middle East, both of the two leading producers, Lebanon and Turkey, have more than doubled their output since the late 1950's. Lebanon is up 191 percent and Turkey, 131 percent. In the Far East, Japan is up 38 percent.

Looking at the "Big 4" Southern Hemisphere suppliers, each has moved up sharply also. Argentina is up 29 percent; South Africa, 129 percent; Australia, 48 percent; and New Zealand, 51 percent. Our neighbor to the North, Canada, is up 45 percent. United States production is up only 8 percent.

Thus the production stage is set. With world apple production already bulging at its seams, now begins the momentous marketing job. What I will describe to you shortly in the way of recent acceleration in competition in our traditional markets abroad is, in my opinion, but a mild prelude of the competition ahead.

Naturally, the traditional apple exporters of the world have all looked to Western Europe as the market for their wares. But now, with Western Europe too bulging at its seams, the cloud of uncertainty hangs heavy as to where we and others go from here.

Let me now review the trade picture in Western Europe. Here, the trade patterns have already started shifting. In virtually every key market of Western Europe, France's rapid and spectacular penetration stands out. It is a fact that France is pressing hard on all fronts. Almost without warning, France suddenly has not only become a net exporter of apples but has already assumed the leading supplier role in a number of European markets.

All of this has happened just in the past few seasons. Prior to 1965, France was a net importer of apples by a sizable margin. For example, in the 1964 season, France imported about 3-1/2 boxes for every one box it exported. In 1965, the situation completely reversed itself and only two seasons later, in 1967, France was exporting nearly six bushels for every one bushel imported. During the 1967-68 season, France moved almost 12 million bushels into export--18 percent of its total crop. Ironically, this volume is almost equal to that which we ourselves exported prior to World War II.

The primary targets for French exporters thus far have been the two largest importing countries in the world, West Germany and the United Kingdom. West Germany--the larger of the two--imports about 22 to 24 million bushels annually, of which 18 to 21 million bushels come from the so-called winter or Northern Hemisphere suppliers. In the early 1960's, France commanded less than 1 percent of the total imports for the winter market in West Germany. By 1967, however, the French share had jumped to 35 percent, or 6.4 million bushels.

The story is much the same in the United Kingdom. In 1962, France commanded only about 3 percent of the total volume imported from the winter suppliers. In the 1967 season, however, France contributed one-third of the total winter imports into the United Kingdom, and for the first time became its leading supplier. But this is by no means the end of France's penetration of the U.K. market. For the first 8 months of the current season, July through February, France has commanded over one-half of the total--55 percent! Within a span of only seven seasons, France has moved from 3 to 55 percent of the total U.K. market.

Thus far, these two markets--the United Kingdom and West Germany--have taken close to 80 percent of France's exports of dessert apples. In addition, France has also become a prominent supplier to its sister state in the Common Market, Belgium, which during the 1967 season took close to a million bushels from France.

Though the volume is still small, France is making overtures elsewhere in Europe. Primary among these are: Ireland, Finland, and Sweden. In the past, all of these countries have been reasonably good markets for U.S. apples. Just a few years ago, France's role in these markets was negligible but by 1967, France jumped into a major supplier position. Imports of French apples into Ireland during the 1967 season totaled 233,000 bushels or 34 percent of the total contribution from the Northern Hemisphere. In Finland, France supplied 358,000 bushels or 27 percent of the winter market; and in Sweden, French supplies totaled 110,000 bushels or 11 percent in 1967.

And perhaps what is even more disconcerting to us is the fact that France is now beginning to look to markets beyond the European frontier. At the moment, the French are eyeing Latin America and in particular, the Venezuelan market. Venezuela oftentimes has been our second or third best offshore customer, taking between 300,000 and 500,000 bushels.

Exposure of French apples in the Venezuelan market began in 1966-67, with trial shipments totaling about 2,800 bushels (48-lb. equivalents). One season later, the volume rose to about 114,000 bushels and the season we are now in promises to register another sizable gain.

Brazil is another Latin American market in which the French have shown an active interest of late. Though the volume is still very small, this too is a spot to watch in the years ahead.

And the French have been testing the Canadian market. Through January of this season, close to an equivalent of 21 cars, primarily Golden Delicious, were shipped into Montreal. The landed cost of the French Golden Delicious in Montreal was reported to be C$5 per carton. It is claimed that the ocean freight rate for these apples from France to Montreal is less than the rail rate from British Columbia to Montreal.

With further production increases in the offing, France is looking desperately for new markets and pounding harder and harder at the more established ones. It is using almost every conceivable means of keeping and winning new customers. It is quite apparent that extremely low selling prices have been the principal weapon. At least one prominent French exporter has gone so far as to guarantee the importer's profit margin.

Despite its fantastic penetration of the international market, it has not been all smooth sailing for France. Surprisingly, France's growth in export has not been sufficient to eliminate the pressures of burdensome supplies. Last season, prices on the French domestic market bordered on chaos. As a result, an equivalent of 5.3 million bushels of French apples were removed from the market through the mechanism of the European Economic Community intervention system. Sizable market withdrawals were also made in other member states of the Community during the course of the 1967-68 season. In Italy, about 7.7 million bushels were withdrawn; in the Netherlands, 426,000 bushels; and in Belgium, 196,000 bushels.

Today, many of the French orchards are outstanding. For cultural practices as well as marketing techniques and vintage offerings, these growers can match the best in the world. However, during the so-called Gold Rush of the late 1950's, many tracts of undesirable land in France--from the standpoint of both soils and climatic conditions--were planted to the Golden Delicious. The fruit now borne from these plantings leaves something to be desired with respect to quality, appearance, and taste. A lot of such plantings were made by small growers. One very effective remedy would simply be to grub out these orchards. But the small French growers are politically potent, and it is highly doubtful that the National Government of France will adopt a policy that would direct these marginal growers to other pursuits.

In view of its difficulties on the home front, the key question now is how long can France continue to exploit the international market at a price which appears to be returning little in the way of profit to the French grower.

Nevertheless, France's already deep and growing penetration of key markets in Western Europe is causing a great deal of consternation and serious reappraisal on the part of other traditional suppliers to that area. With the home crops expanding appreciably beyond the needs of their own frontiers and with so many of these countries desperately in need of export earnings, a real battle is in the making.

Up to the present time, Italy has perhaps been the major victim of the French expansionary efforts. Though Italy is still the No. 1 European producer and exporter, the French are rapidly whittling away at Italy's supremacy. The gap has already narrowed appreciably. During the first half of the 1960's, Italy's exports ranged from about 20 to 23 million bushels annually. Last season, Italian exports fell to a shade less than 15 million bushels--a drop of 5 to 7 million bushels.

In the two key markets of Western Europe--West Germany and the United Kingdom--Italy's relative standing has fallen sharply. In West Germany, the Italian share of the winter market dropped from 71 percent in 1960 to 46 percent in 1967. In the U.K. winter market, Italy's share dropped from 42 percent in 1960 to 27 percent in 1967, and to 25 percent thus far this season.

What is perhaps a more critical and enduring blow to the Italians is the sizable loss of the French domestic market. Prior to its ascendancy into export, France provided a ready market for Italian apples--from about 2-1/2 to 3-1/2 million bushels annually. But by 1967, France's imports from Italy declined to slightly less than 1-1/2 million bushels, marking a real loss of 1 to 2 million bushels.

Largely because of foreign competition, the ill-famed Italian variety, the Abbondanza, which at one time figured prominently in Italy's exports, has fallen by the wayside and is now processed largely for industrial alcohol.

How has all of this affected the United States, particularly in the European market? Naturally, our high price level of the past two seasons has seriously limited our ability to compete in export. Nevertheless, this vacuum has provided the French an excellent opportunity, through much lower prices, to capitalize on our deficiency. The French apparently have capitalized well.

In almost every market we look, our volume and share have dropped sharply. Traditionally, the United Kingdom has been our No. 1 customer in Europe. Just a few seasons ago, we supplied from one-fourth to one-third of the U.K. winter market. Last season, our share dropped to 13 percent. And in the current season, through the month of February, our share stands at slightly less than 3 percent.

Finland is another more important market where we have lost ground to the French. Prior to the French invasion, the Finns generally took between 250,000 and 400,000 bushels from us. In 1962, for example, the Finns took 328,000 bushels from us and less than 1,000 bushels from France. A mere 5 years later, in 1967, our leadership was no more. The Finns took 358,000 bushels from France and only 171,000 bushels from us. Our relative standing as a winter supplier in the Finnish market dropped from 36 percent in 1962 to 13 percent in 1967.

What can we say about our future in export? Based on what we have seen in the very recent past and our expectations of the European supply potential from within, our future in Europe looks very dismal indeed. What will happen if and when our own prices return to a more competitive position, remains to be seen. Certainly our lack of continuity in export for the past two successive seasons does not make our job any easier. Nevertheless, should we decide to fight for a share of the European market, we are likely to have to fight harder even to stand still, let alone grow. Perhaps our best hope lies as a specialty supplier--supplying varieties that other countries do not produce or cannot produce well.

Aside from Europe, what is the situation elsewhere? Insofar as Latin America is concerned, Venezuela and possibly Brazil are the only two markets worth looking at for the moment. The economics of most other countries within the Latin American bloc are weak and are likely to remain so, for some time to come. Our ability to stay in the Venezuelan market will depend upon our ability to compete effectively with the French. Getting our freight rates on parity with those of the French is the major task ahead.

Brazil offers a reasonably good potential as an apple market *per se*. We have had some concrete evidence to that effect a few seasons ago when we managed to get a little over 100,000 bushels into Brazil. So far, our efforts to reduce the high Brazilian import duty have been thwarted by the Argentines. Both Brazil and Argentina are members of LAFTA. Because of this membership, Argentine apples enjoy a duty-free status in Brazil, and Argentina is doing everything possible to protect this margin of preference.

Argentina, a prominent late-winter and early-spring supplier to Europe, is also running scared of the trend toward

European self-sufficiency. The continuing growth in storage capacity in France and Italy is giving the Argentines good reason to start casting elsewhere for new markets. Argentina has already been hurt badly in the French market. Not too many years ago, the Argentines had a 1 to 1-1/2 million bushel market in France. Last season, France took only 157,000 bushels from Argentina.

Looking to our neighbor to the North, Canada, the situation is far from encouraging. Chances of increasing our participation in that market are indeed remote. Like us, the Canadians have been having their difficulties in the U.K. market because of the increasing presence of French apples. The United Kingdom has been a highly important market to the Canadians, taking roughly in years past about 40 percent of Canada's exports. Over the past three seasons, its share of the U.K. winter market has dropped steadily, from 29 percent to 11 percent. Canada has also tried to extend itself in the Scandinavian market but again such efforts are being dampened by the French. So, with shrinking market opportunities in Europe, Canada must also turn elsewhere. Not only will they likely entertain the same offshore market possibilities as we, but they may be forced to press the U.S. market more vigorously than in the past.

With Europe approaching a "closed-door" situation and with limited market opportunities in Latin America, about the only area of the world we can turn to at the moment is the Far East. This area offers some possibilities but to capitalize on these will call for very hard work. Because of the increasing storage potential in Western Europe, some of the Southern Hemisphere suppliers--notably, Australia, New Zealand and even Argentina--are also scouting the Far East market.

Industry observers in Australia are strongly of the opinion that increasing production in Europe together with their mounting supplies held there under controlled atmosphere storage will progressively diminish the normal seasonal gap which once provided Southern Hemisphere fruit with a very attractive market on the Continent.

Australia has been successful in stepping up its exports to such markets as Malaysia and Singapore and has been able to maintain a fair volume into Hong Kong. To make matters worse for us, more recently, the Australians are intensifying a policy of "carrying coals to Newcastle." On the basis of evidence thus far this season, Australia's attempts to broaden its distribution in the United States late-spring and early-summer market have met with some measure of success. We now are finding Australian Granny Smiths reasonably prominent not only in the larger metropolitan markets along our Atlantic Coast but also in California and the Pacific Northwest.

In summary, the international trade outlook is far from encouraging. The stakes will be high; the rewards uncertain. The increased tempo of competition in the world market is not, however, something peculiar to apples alone. Nearly every horticultural commodity of historical prominence in the U.S. export scene--whether it be an apple, a canned peach, or an orange--is experiencing the same common theme: competition. Our competition has learned well.

Our once well recognized superiority in producing and marketing a quality product is no longer ours. Whether it be a Hungarian Red Jonathan, a Golden Delicious from Southern France, or an Australian Granny Smith, we find them coming to market increasingly in their "Sunday best." They are coming more and more from a modern, well-cared-for, well-managed production plant.

Under such conditions, the decision to participate in export can no longer be a random one. If we are not there, year in and year out, with a good product at a price with which the importer can be assured a profit, he is not likely to have any qualms in shifting his allegiance to other suppliers. With a large market in our own backyard, the natural temptation has been to stay at home in times of short or even average supplies. From the short-run point of view, this philosophy is perhaps the most rewarding. But should our harvest ever reach a level consistently beyond our domestic needs, the enthusiasm for such a philosophy will vanish quickly.

For a number of our major horticultural commodities, the problem of shrinking exports is being compounded by the threat of imports. Specifically, in the case of apples, it is noted that for the first 9 months of the current season, July through March, we are in a net importing status, i.e., our imports are larger than our exports. In order to find a comparable situation, we have to trace back to the 1952-53 season, when we had a national crop of only 94 million bushels--25 million bushels less than our crop of today. Though today's excess of imports over exports is presently small (about a half million bushels), it should give us cause to ponder. Let us hope that this is not the introduction to our future.

PROBLEMS AND OPPORTUNITIES IN THE SALES OF FRESH APPLES

Harold Copple
President, International Apple Association
Sales Manager, NuChief, Northwest Wholesale
Wenatchee, Wash.

Today you are going to find me optimistic about the prospects of the fresh apple market. The end of this story will be: the opportunities are considerable, and the problems are manageable.

The Northwest has been oriented to the fresh market and will continue to be. I do not know of any growers that are planting for processing. There are not many centralized plants here that are either inclined or able to divert from fresh just to keep processing alive. Processors have had to live on what was left of the crop, but I hope fresh marketers will begin to give more general consideration to a supply for processing. As the price processors can pay for apples has increased, we have more and more used this outlet to dress up our fresh pack. This trend will increase as quality levels keep climbing for fresh, and as we get into production on all the Golden trees that are planted in the Northwest. The Golden grower in particular is going to become dependent on more processing.

Exports to Europe for the 1968-69 season are the lowest in history and for the United States probably will not reach 2 percent of the crop. The principal reasons are competition of European production and devaluation of currencies. Most of us feel export to Europe will not be important to apples; pears show more promise, but there is some hope of doing business in the Orient, and we will keep trying. Some business to South America will continue but it is running into quotas, money, and credit problems.

Our concern now has turned to imports. Imports from Canada are substantial but are spread throughout the whole season and through many markets to minimize the impact. French Goldens are being imported in modest quantities; they are cheap, but mostly of low quality. Our greatest concern is with the Southern Hemisphere production: New Zealand, Australia, Argentina, and a relatively new industry in South Africa. Just 2 years ago these imports were a mere trickle. Devaluation of the pound plus our own high prices have made our markets very attractive, and the tide is beginning to flow. Two vessels from Australia have landed recently on the East Coast with a total of 301,000 boxes of apples and pears. The trade estimates that imports this season from the Southern Hemisphere into the

United States and Canada of apples alone will probably reach 500,000 boxes. This may not seem like much in comparison with a 125,000,000 U.S. crop, but they all come into the fresh market and during 2 months of the spring when our own supplies are down, and we are playing a tight market. Quality is usually good and will get better; unless the increased flow is restrained it will seriously affect our late marketing program. These same countries have severe import restrictions, and we trust our own government will ultimately recognize the need of reciprocity.

Apples are produced in most of the States commercially, and in every region production and handling have improved to meet the requirements of the fresh market. To avoid the fall glut, the larger regions have more and more spread their crop into the spring, and the late market has become a very valuable part of market planning. Controlled Atmosphere (CA) and DPA have permitted all of us to plan our marketing without much regard to the calendar. United States fresh holdings, May 1, were 7,200,000 boxes of which 4,600,000 were in CA. Of these less than half are in the State of Washington. Of the 2,600,000 in regular cold storage however, most are Winesaps. May 1, the State of Washington had 23 percent of its crop yet to ship, and to the grower this is the profit part of his crop. So a half million of imports does make an impact, and if this in time doubles or triples it will have a substantial effect on marketing programs, not only for the Northwest but for all apple growers of the United States.

Now as we lighten the pressure of the fall market by stretching the crops of the important regions further into the spring, we leave the early market freer for those who do not have adequate storage and must move in the fall. This opening is attracting additional regions, and heavy plantings of apple trees have been made in early areas, such as North Carolina (in 5 years from a million and a half to an estimated 8 million for next year). Just as in any marketing, there is no void that is not quickly filled by a competitor, so many growers are planting and more are planning toward an August apple that will beat others into the market. It won't be very long until we have good apples at retail 12 months of the year. My directors used to suggest we should get into the potato business to cover our summer overhead but controlled atmosphere on one end of the season and early apples on the other will soon keep us tied to the desk, year around.

Please understand of course that the Washington crop and the U.S. crop could all be sold in a shorter season, but at lower prices. Good marketing strategy dictates a longer selling season.

As good CA apples become more available in May, June, and July, retailers have found they can keep selling in reasonable volume, and that late good apples are a profit item. In fact, each of us needs a supply to hold our customers. Controlled atmosphere storage will increase; we do not know where the saturation point is but we have not yet reached it. The limiting factor may be selection of the fruit for CA as much as the ability of the marketer to absorb. Use of Alar may help.

A tight marketing strategy is of course always subject to error and the consequences are costly. A marketer is expected to stretch the string as tight as possible without breaking it--to extract every bit of value out of the market without dangerously slowing movement. We have statistics and experience to help, but half the market is in people's minds. There is often no explanation why demand goes up or down. The Golden Goose is always walking a very thin line and sometimes we kick her off balance. We did this with Goldens last fall. Our statistics were off and we thought we had a short crop. We held at $7.00 for Extra Fancy trays for too long and built up a serious backlog of supplies. Retail pricing was high. It cost $1.50 adjustment in f.o.b. prices and then a lag of 6 weeks for retail to adjust, but finally the variety began to move in real volume and is now in good shape.

This lag between a lowered f.o.b. price and its reflection at retail is a vexing thing, but there are good reasons for it. The real answer is to be right in our pricing at the beginning of the year. In theory we agree with the economists that suggest our opening prices should be low enough to encourage good movement and to allow for gradual market improvement throughout the season. In practice however growers are watching each other more than the market and sometimes marketers watch each other more than they should. We are competing with each other for the market and also for growers here at home. There is no getting everyone together in building a market; no segment can risk selling his fruit for less than he can get and building a market for the other segment. Marketers have good communication with each other but not agreement. Even if it were legal, there would be no collusion because each is too independent in his thinking and his actions. Result is a compromise with what we know we should be doing, but usually we wind up the season feeling we have gotten out of the crop everything that was in it.

As you know from the tree counts of this State the Golden Delicious variety is due for the biggest percentage increase in production. Some feel the Golden will become our number one problem, but I am more optimistic. I believe the answer is here at home. If by grade rules, packaging, and whatever, we deliver a more uniformly good Golden, the market will take a substantially increased volume. We hope Alar will help us better control size and get more into the middle of the manifests. We hope processors will find new products for Goldens that will permit them to pay an even better price. Because one poor load of Goldens in a market will adversely affect all of the trade more than a poor load of other varieties, I believe the improvement of product must be universal, at least within a region, probably brought about through stiff grading rules.

Fortunately for the Northwest the real volume now and in the future is in Red Delicious. Across the country there is a staggering total coming up but this variety has many things going for it.

The new plantings are in improved sports, and the old Reds are being rotated out. The product will be outstanding. The variety is very responsive to promotion at retail. Kids love them. Red Delicious are established as an excellent profit item at retail. It is easier to get larger displays and special merchandising attention. A good Red is the salesman's favorite. There is no substitute for salesmanship.

In summing up the prospects for fresh apple sales, we in the Northwest must admit that we are raising a semiluxury product. We are married to a concept of fresh as our primary source of income, and this makes us more susceptible to any change in affluence or whim of the housewife. Clarence Adamy, President of the National Association of Food Chains, described the American consumer as "a troubled stranger in paradise."

We are not discounting the considerable increase in production of apples projected throughout the whole country, a fair part of which must go fresh. While nature has a way of leveling this out there will be years in which every region comes through with a bumper crop, and we will have to slug it out with each other. On the other hand I believe the market will take a considerable increase in volume of really good apples at profitable prices. I am confident fresh apples will have a good future if we recognize and accommodate ourselves to the changes that are coming. It will be exciting and demanding. My description of an adequate and complete marketing service will:

1. Start with the grower. In the Northwest he will plant, prune, and grow for quality fresh. He will be in trouble if he cannot produce a crop that will pack out a good percentage of real top quality.

2. Good handling will require even more storage and all of the things that will make the product more attractive. Most handlers already are waxing. New packaging must be developed. There will be loading onto pallets or slip sheets or however the buyer wants them. Quality control will tighten up even more. I am convinced really good attractive apples will sell in much larger volume, but there will be less and less room for anything but the best. This puts the burden on processing for absorbing more of the crop that falls below high standards.

3. We will have a more comprehensive and probably a more expensive marketing program. There will be more information on which to judge the market and more liaison between marketers. The cost of being wrong is increasing and we must be right.

There will be more service to the buyer. Bigness and merger are catching on in the produce business. Old lines of distribution are being disrupted. Some old firms and many new ones are emerging as leaders and others are diminishing. Many old time jobbers are losing out--and becoming a credit problem--these were the ones that in the past have taken a range of sizes and were able to use at a price something that was a little off. The growing volume outlets have the computer upstairs as "king." Usually the buyer is handling 50 other items and does not have time to give as much attention to apples or any other commodity as the old time produce man. He therefore puts the burden back on the seller to keep him right with the market and supplied throughout the whole season with his needs. He is less flexible and usually demands a single or a narrow range of sizes. In the eyes of his management his greatest error would be to get in a load that was not attractive and would not move quickly through his warehouse. If his wants are not supplied, he will go to someone else. The result is the marketer spends more time managing inventories, rustling items that he does not have, and in general serving those fussy but vital volume accounts. We already are doing this with many outlets, but it will become general practice.

Along with service will go more travel and more time of the salesman with the buyer so he can better project requirements and manage supplies. Again there is no substitute for good salesmanship. We have a customer as long as the buyer has respect and confidence in the supplier and as long as he delivers to this buyer what he wants when he wants it. The result is volume movement and that is where the apples will be sold.

4. Promotion is the life blood of selling and we are going to need more and more of it, both on a regional and a national basis. The regional programs of apple advertising and

promotion are doing a tremendous job. In comparison with competitive products, apple promotion is not well enough financed, but for the dollars spent, the results have been tremendous. Apples lend themselves to promotion, and an additional investment would bring rewards out of all proportions to the cost.

In closing, a secure future in the fresh market for apples will require improvement in growing, handling, marketing, and promotion. With these four items I am sure we will have a good fresh apple market for a long, long time.

PROBLEMS AND OPPORTUNITIES IN THE SALE OF PROCESSED APPLES

M. E. Knouse
Chairman of the Board, Knouse Food Cooperatives, Inc.
Peach Glen, Pa.

The apple processor, like all American businessmen, faces many day-to-day problems in the conduct of his business. Some special problems, however, are connected with processing apples.

Problems

The processor must be able to guarantee his customers a steady supply of apple products, whether it be juice, sauce, or frozen product. He, in turn, must be assured of a reasonably stable supply of fresh apples for processing. Washington apple growers, particularly, appreciate the problems of short supply of fresh apples after a year such as 1968 when it is necessary to ration production to customers. The apple grower cannot look on the processor solely as an outlet for cull apples or surplus lower grades when available. The grower and processor must work closely to assure a steady supply of raw material each year.

We are a firm believer in quality in processed apples and believe that high quality processed apples can only be obtained from high quality raw material. Green or overripe apples are not improved by processing. Apples are a perishable product and should be treated accordingly. Every load of apples delivered to our plant is either in the can or in cold storage in 24 hours. We need to learn more about the specific physical and chemical properties of apple varieties for different products and how to blend optimum proportions of several varieties for applesauce or juice. Mechanical harvesting of apples will, undoubtedly, increase the number of bruised and injured apples coming through our raw material lines. This, in turn, will result in increased cost of trimming and waste disposal. Careful studies will be necessary to determine if lower harvesting costs compensates for these added costs.

Fruit products which compete with apples, such as orange juice or grape juice, appear to be further along the way to mechanical harvesting. This will undoubtedly result in lower cost for these products which, in turn, will affect the price of apple juice.

We must work hard on the problem of quality control. Our customers want a high quality product which is uniform from year to year. This may require careful blending of varieties and recognition that there are certain regional preferences in flavor and appearance.

It has become increasingly difficult to get high quality, well-trained people into the food processing industry. I have become very much impressed by the important role that women can play in our labor force. In our own plant, women forklift drivers are more safety conscious and handle equipment with more care than men do. This results in fewer dented cans. I expect to see more women both in the work force and in management in the near future.

Processed apple products are a low margin profit commodity. This means we must cut waste and labor to a minimum. Recent developments in automatic peelers offer hope that we may reduce peeling losses we now get from older machines.

If the apple processing industry is to help market the increased production which has been talked about at this conference, we will have to increase our efforts on new product research and learn how to better advertise and promote apple products. It may require contributions from the entire industry to finance such an effort; however, such contributions will pay for themselves many times over.

The apple processor must watch his marketing practices carefully to see where he fits into the current competition between nationally advertised and private-label brands. Private-label brands are those owned and carried by such large supermarket chains as A & P and Safeway. The institutional size #10 can offers the small food processor a chance to market his output without the heavy advertising outlay required for national brands and without competing with private labels of chain stores.

There are many men in the apple processing industry who feel that carryover of inventory from one year to the next is harmful. The attitude of the industry varies on this point. I feel that a nominal carryover is a healthy way to even the supply from year to year and to keep customers supplied during a year of short supply of fresh apples. If your apple products have high initial quality, there is no reason why you cannot hold them for 3 to 5 years and still have a good quality, marketable product.

Opportunities

A population which is increasing both in size and in affluence offers us a good market for our products. In the current vogue for "convenience" products, we must stress that canned applesauce and canned apple juice are some of the most convenient of all products on the market and are accepted by a large proportion of the population.

While new products are desirable, we must be alert to the risk that not all products that we put on the market will be accepted by the consumer. Recent surveys show that less than 25 percent of new products are on the market after 1 year. Nevertheless, for those that do succeed, the economic rewards are great. We must be willing to contribute to promotion of our products by constant communication with the consumer, who is the one real customer that we have. Today's housewife enjoys experimenting with good recipes. We should supply her with such recipes. We should also point out that many apple products go well in combination with other foods, such as pork. The Processed Apple Institute has done an excellent job in promoting processed apple products and deserves our support.

We are fortunate that such products as applesauce are well accepted by young people, who represent an increasingly large proportion of our population. Applesauce is an economical, nutritious, convenient, and highly acceptable food which deserves a place in the school lunch program. We should make aggressive efforts to see that its use is expanded in the school lunch program.

As in any business, we must remember service and sales are partners in marketing, and we have to keep our customers supplied with information and promotional material on apple products.

We must work harder in our planning for the future. Can we find a way to keep from overcrowding our markets with products not wanted or needed? A few years ago apples and red, sour cherries were in oversupply, resulting in a highly depressed market. Last year there was a shortage of both apples and red, sour cherries. Customers who couldn't get apples or cherries found other commodities.

Many vegetables and some fruits, such as cling peaches, are on marketing orders which insure a supply sufficient to satisfy demands of the consumer but hold down excess production. Such a marketing order must, of course, be completely voluntary. Many problems arise with marketing orders. Shall they be managed by growers, processors, or special marketing organizations? Marketing orders for apples would be easy if we had the will to manage supply. The question is "Who will take the leadership to stabilize marketing?"

A significant development in recent years has been the acquisition of several apple processors by large conglomerates. The following will give you an idea of just how far this process has gone:

Conglomerates	Apple processors absorbed
Borden	Comstock (New York)
Agway	4 Companies (New York)
American Tobacco	Duffy-Mott (New York)
Pet Company	Musselman Co. (Pa. and W. Va.)
Consolidated, Inc.	Michigan Fruit (Michigan)

About half the production of apple products is now in the hands of conglomerates, and in each case the apple production is only a small part of the sales of the parent company. Those processors who are approached for incorporation into one of the large organizations might consider whether they will have complete autonomy or the power, right, or condition of self government and independence with only normal subordination.

In conclusion, the apple processor has a large responsibility to the whole apple industry. Apple processing can help stabilize marketing by absorbing lower quality apples unsuitable for the fresh market and excess supplies during bumper years. Processed apples can be held in a stable form from year to year to help even out the vagaries of weather and offer the consumer a convenient, nutritious, and economical food product.

PROMOTION AND ITS POTENTIAL

Robert Button
Manager, Appalachian Division
Blue Goose Growers, Inc.
Hagerstown, Md.

Promotion is defined as the active furtherance of the sale of merchandise through advertising or other publicity. The term promotion as it relates to apples then is all encompassing and includes trade meetings, display kits used by retailers, conventions, appearances on radio and TV, the Apple Pantry and Apple Kitchen releases, direct advertising, news stories, ads in trade journals, and a host of other activities engaged in by individuals, companies, trade associations, and others in our business.

The history of these activities goes back to the very beginning of apple sales. One of the first promotional stunts I ever observed, even though I didn't realize it at the time, was a device my father would use in the public markets in Detroit. He would present a freshly cut half apple to a prospective customer with the invitation, "Here, try this!" After one bite from this selected sample it was quite difficult not to buy the product. Unfortunately, we cannot, under today's marketing system, make this direct appeal to the customer. She must be reached on a mass basis in a more detached manner.

Washington State provided the first organized approach when it formed the grower supported Apple Commission back in the late 30's. Michigan and several voluntary groups in the East, such as the old Appalachian Apple Service, soon followed Washington's example. All of these State and local groups did notable jobs on very limited budgets.

In the last 20 years, most every area has developed a promotional body of some type with rather certain financial backing. Washington State continues to lead the way in total monies expended and sophistication of programs, managed by a highly trained staff.

Compared to some other commodity groups and to other industries in general, we are still spending far too little in the promotion of our product. It has always been near to impossible to accurately measure the results of advertising and promotion, but we have only to look about us to observe the success of many other products. The fact that "Coke" is consumed throughout the world can only be the result of intensive, well-financed promotion. There are many products now used by practically everyone that were not even on the market 10 years ago. Remember, apples have been here since the dawn of recorded history. If you accept the fact that promotion can and does increase the sale of our product, how best then can we utilize it?

In my opinion, we have in the past been entirely too provincial in our promotional efforts. We have devoted a considerable amount of time, money, and energy to the idea that the product from one area is better than the product of some other area. Make no mistake about it, we are in a struggle for our share of the business not only against other apples but also all other food commodities and even nonfood items. Our sales fall into two general classes, fresh and processed product. We cannot neglect one for the other but must push both categories to the fullest, as we all raise both kinds of apples. Even here in Washington where you are strongly oriented to fresh sales, about 20 percent of total production goes to some processed product.

I firmly believe that we are about to enter a new phase of our total promotional effort for apples. There are many indications of coming changes of attitudes on the part of members of our industry and indications of changes in our organization structures that could give us a tremendous boost forward. As I see it, none of these potential changes need be a threat to those existing State and regional organizations already engaged in promotional efforts. In fact, I think these new approaches will add power to present programs. It is imperative that we get the most out of every dollar spent for promotion. We cannot afford the luxury of duplicated services.

I think it is time to launch a national program of apple promotion as apples, with no reference to variety, area of origin, or form as to fresh or processed. This effort would greatly augment everything we are attempting to do now. All of us, no matter what our place is in this industry, will have a brighter future in an industry that is expanding in scope rather than trying to hold onto our little piece of a shrinking whole. Promotion in its broadest sense can do wonders for the apple business. I hope we all see fit to support it so that we will be of service to our industry and ourselves.

CREATIVE MARKETING OF APPLE PRODUCTS

Ned Greene
Program Director, Processed Apples Institute, Inc.
New York, N. Y.

"Creative Marketing of Apple Products"--that optimistic title--means two things: The creation of new sources of demand for applesauce, apple juice, and sliced apples; and the use of a creative approach to persuade the consumer to use more of the industry's products by showing their many advantages.

The Processed Apples Institute, which works exclusively to create national consumer demand for apple products, is an organization of processors of apple sauce, slices, and juice. P.A.I. is a trade association currently consisting of 16 of the nation's foremost processors. Its members represent about half of the industry's total production.

Today it would seem most helpful and interesting to talk about some of the things P.A.I. is doing in the various areas of promotion. But perhaps we should start by pointing out why special promotion is needed for processed apples.

Can't we promote just apples and cover both fresh and processed? As Mr. Knouse pointed out, we do start with a "pool" of apples. The answer according to research done at Cornell University and elsewhere is there is no type of promotion that will do an equally good job for both fresh and processed. There is no connection between the two in the mind of the consumer. The fresh apple is a piece of fruit that can be seen and touched, while processed apples are in a can or a jar or a bottle. If you are selling a can of apple juice, there is no advantage in talking about crunchy apple taste or other features of the fresh apple. So we do need two distinctively separate types of promotion, and what we are doing to help sell processed apples is what I would like to describe to you today.

The largest single effort in our promotion program is directed to the consumers chiefly through newspapers. We reach the newspapers in three basic ways:

First, through our regular mailings to almost 600 editors of major papers. These go out at least every month and sometimes more often, as before Christmas when we send out a special advance holiday mailing.

The second way is through the syndicated columns, which in turn are distributed to many papers. If King Features or

United Press International uses a column or a recipe, it will go to more than 1,000 papers through one placement. We also pay individual attention to the very large newspapers, like the New York Times or the Chicago papers, and to the Sunday supplements.

But it's always better to be specific, so we will show you 20 newspaper clips, each from a different recent mailing. We put them on three slides so you could get an idea of the types of material we have been sending out. This is really the backbone of our newspaper promotion, and we try hard to build up confidence on the part of food editors in our material so they will use it regularly.

We send out a new set of photos, recipes, and stories every few weeks. Clippings come in every day from cities all over the country. Many of the editors use our photographs in three or four columns. In the course of a year we send out about 30 photos to every major paper, sometimes two or three at a time, with recipes and articles. Where a city has two or more major papers, we send different photos and material to each one. Tying in with a particular season or holiday usually helps.

Syndicated articles often carry such by-lines as Alice Denhoff and Joan O'Sullivan of King Features, Gaynor Maddox of NEA, Jeanne Lesem of United Press International. As you know, these syndicates have terrific circulation.

The big metropolitan dailies usually want special material for the Sunday supplements, and stories of ours often appear in the New York Times, Chicago papers, and West Coast papers. We keep circulating 8x10 in. color transparencies to newspapers that have not yet used them, or color photos are sometimes requested from a sheet of color prints we send to all newspapers that use color. To reach the maximum number of newspapers using color, we have also developed a full color page cooperatively with French's Mustard and Green Giant. The page includes our Party Apple Creme plus three other suggestions using applesauce or apple juice. It is offered to newspapers that use either color mats or transparencies and has already been used by over 30 major metropolitan dailies.

We want to shift for a few minutes to magazine promotion, which is important both because of the buying power of magazine readers and the sheer numbers of readers reached. Woman's Day claims over 11 million readers, for instance. In one recent quarter, P.A.I. had 35 recipes or features on processed apples published in major consumer magazines.

American Girl with a circulation of over a million young people (one of our key markets today) contains recipes and ideas specially designed to meet their particular requirements. For instance, the recipes we furnished them have titles like "Frank-ly Apple-ly Bunwiches," "Sassy Bonbons," and "Apple Juice Frostee."

Dodge News Magazine is one of the house organs to which we furnished material; it goes to 100,000 or more clients of Dodge dealers. As you see, they used one of our color transparencies and quite a few recipes.

Another market area to which we pay special attention is the Negro and Spanish-speaking market. One of the key Negro publications is Tan, and here is a feature photo we developed specially for them with a story and recipe for Lemon Apple Glaze.

The October issue of Woman's Day contains a rather nice insert--the Collectors' Cookbook on Apples. The cookbook contains recipes for both fresh and processed apples. We developed the original idea with their editors and furnished a big selection for their processed apples recipes.

You may wonder how these placements come about, and just how we go about presenting ideas and suggestions to these editors. The traditional way has been to invite the editor out to lunch and we still sometimes do, but what we have been doing with great success is to invite them to have lunch in our own dining room at P.A.I. headquarters. Here they discuss ideas for articles or recipes with our home economists, and sometimes other account executives join them. When we have a particular new recipe to suggest we prepare it for them and serve it as part of the meal, or sometimes we will let them taste what we have worked up before lunch.

This year we have been placing more emphasis than ever on the electronic media and have prepared a new series of slide-and-script packages for television stations to use as part of their own programming. It's a complete package with slides taped to a card and numbered. It has a script which can be read or used as a discussion starter. We also enclose a return post card asking them to let us know if and when they can use the material, because with some we also furnish recipes to viewers.

P.A.I. now has two 5-min. color films designed primarily for use on television. "Let's Have A Party" has been in distribution for 2 years and through December has been shown on 181 TV stations. It even won a certificate award for excellence in educational films. We have just completed a new 5-min. color film this year called "Apple Happenings" which is designed to be shown by itself or as part of a longer film version called "Tips for Gracious Entertaining." As part of the longer film, it becomes more suitable for clubs, schools, and resort areas.

We have also developed a good many kits of materials, usually in cooperation with a manufacturer of a noncompetitive product. These are particularly popular with the television stations since they can develop their own program around them or personalize them as part of their own show. Our own people do personal appearances as guests on shows around the country when they travel. In these cases they usually have a series of good apple ideas and recipes which they demonstrate live on the show.

In radio we prepare a new script every month describing an easy recipe or a good idea that makes use of applesauce or apple juice. These scripts are sent to major radio stations around the country. We include a return post card for telling us whether or not the station has used the script and adding any comments. Every one of our scripts is used by over 200 radio stations each month. We also used radio distribute literature. We offered a fold-out piece, "Apple Goodies Make the Scene" to broadcasters who agreed to distribute it to their listeners--13,000 were furnished to the stations. In addition, we offer radio stations a record containing a 4-min. interview under the title "Microphone Manhattan." The interviewer talks with a professional dietitian who has interesting ideas to offer on preparing dishes with applesauce and apple juice.

We've talked about the importance of color in newspapers and magazines. The same idea more than holds true in the institutional food service magazine field, professional magazines of the restaurant operators, the hospital dietitians, the school food service directors, and so on. They shifted to the use of editorial color quite dramatically in recent years. We shifted with them and are now trying to display our recipes and ideas in color, particularly in an important spot such as a frontispiece or a cover.

Two key elements of our institutional program were made possible by a Pennsylvania contribution to P.A.I. The first was the printing of 50,000 of each of two menu tip-ons, one promoting apple juice, the other applesauce. We have offered these to restaurant operators in three basic ways. In the first few months that the tip-ons were available, 100,000 were distributed. We have printed an additional 50,000 of each, which we are currently distributing.

The second project is P.A.I.'s booklet in color for restaurant operators. It is called "Creating Premium Specialties with Apple Sauce, Apple Slices, Apple Juice." The booklet shows the restaurant man how he can make these premium dishes with just a few cents worth of apple products, a few moments of time, and a touch of creativity. The National Restaurant Association has distributed 14,000 copies to their members and has endorsed it by allowing their name to be used on the cover as a co-sponsor. And next week we will be putting on a half-hour program at the 1969 National Convention in Chicago, based on the photos and information in the booklet. A slightly different version of this program is being used now by a number of States in their own programs. We offer slides and script so they can put on the show themselves.

CONSUMER USE OF APPLES AND COMPETING FRUIT PRODUCTS

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Agricultural Research Service, USDA
Hyattsville, Md.

My assignment here today is to discuss the consumer use of apples and competing fruit products, as indicated by the findings from the spring 1965 nationwide household food consumption survey which was conducted by the United States Department of Agriculture.

It is a privilege to be invited as a participant in this session on "Factors Affecting Demand and Orderly Marketing," and I trust that some of the information obtained in this survey will serve a useful purpose in marketing analysis and planning. But first, you might find it helpful in interpreting these survey results if I told you a bit about who we are and what we do in the Department of Agriculture. The Food Consumption Branch, which I represent, is in the Consumer and Food Economics Research Division of the Agricultural Research Service. Its other two branches are Food and Diet Appraisal and Family Economics.

The Food and Diet Appraisal Branch is possibly best known for a publication with which some of you may be familiar--Agriculture Handbook No. 8, "Composition of Foods." It is a widely used reference book which gives the composition, by nutrients, of nearly 2,500 items of raw, processed, and prepared foods. This Branch also is engaged in a number of special studies to backstop action programs of the Department, such as the School Lunch Program. It develops and maintains on a current basis a series of food plans, which indicate the estimated cost of food at home at several cost levels for families of different composition and size.

The Family Economics Branch is concerned with research on household expenditures of rural families. In cooperation with the Bureau of Labor Statistics, this branch conducts periodic surveys of expenditures by rural households as a basis for revisions of the Consumer Price Index.

Our Food Consumption Branch conducts periodic nationwide surveys of household food consumption as well as special surveys of particular population groups, or for special purposes. The most recent nationwide survey was conducted in the 12-month period April 1965 through March 1966. Previous surveys were conducted in 1936-37, 1942, 1948, and 1955. Whereas most of the earlier surveys obtained food consumption information for the spring season of the year, data were obtained for all seasons in the most recent survey. Today, however, I will be reporting on results from the spring portion of the 1965 survey. For the first time, also, food consumption information was obtained for individual persons in households during the spring 1965 survey.

What kind of information did we obtain in this survey? From a total sample of about 15,000 households, of which 7,500 were in the spring survey, information was obtained about the quantities of food used in the household in a 7-day period. Results are reported for some 250 foods or food groups, showing the average quantity used per household in a week, the average money value, and the percent of households using these foods. The results are reported separately for four regions, by urbanization (urban, rural farm, or rural nonfarm) and by income classes of households.

The principal objectives of these surveys are: first, to obtain a measure of the quantities of various foods consumed in order to evaluate the quality of household diets as well as the diets of individual household members; second, to obtain information on the kinds and quantities of foods used and the money value thereof in order to provide data for economic and marketing analyses.

Quality of diets.--Very likely you have heard references to some of the findings stemming from the first objective, pertaining to the analysis of diet quality. This involves the calculation of the nutrient content of foods used in the household and comparing these nutrient levels with the quantities needed to provide the recommended allowances of nutrients as established by the Food and Nutrition Board of the National Research Council, National Academy of Sciences.

Information was obtained on the money value of food used at home and also for the expenditures on food away from home; however, household consumption data in terms of quantities were obtained only for foods used at home, and in the form in which they "came into the kitchen," as we say. Nevertheless, the calculation process did take into account away-from-home eating by comparing the nutrients in food used at home with only that share of the recommended allowances which was proportional to the number of meals actually eaten at home (out of a total of 21 meals in a week).

About 50 percent of the households had diets that were rated "good," which meant that the food used met the allowances for food energy and seven nutrients. On the other hand 21 percent had diets which were graded poor because they did not meet at least two-thirds of the allowance for one or more nutrients. This level of diet quality was not as good as 10 years earlier, when 60 percent of the household diets were good and 15 percent poor.

I should mention here that the survey results pertaining to diet quality are not to be used as a basis for ascertaining the existence of malnutrition or hunger, nor the nutritional status of people. To obtain such information, physical examinations and biochemical tests would be required. It was not the purpose of this particular survey to obtain such information. Nor are the results as shown to be interpreted as the need for indiscriminate fortification of foods or self-prescribed supplementation of individual diets with vitamins or minerals. Nevertheless, the results do indicate the need for nutritional education and greater effort to improve diets.

There is much concern these days about the diets of low income people, but results of our survey indicated that poor diets were not limited to low income households. In fact, 9 percent of the households with incomes of $10,000 and over a year had diets which rated poor.

The special survey of individual members of the household involved obtaining data on food used in a 24-hr. period. Because food used on a given day may not be typical for certain individuals, results were shown in terms of averages for 22 different sex-age groups, which were developed to correspond with the same population groupings published in the Recommended Dietary Allowances. For the United States as a whole, calcium and iron were the nutrients found to be below the allowances in more of these sex-age groups than any other nutrient.

Food spending.--In spring 1965, the average U.S. household used food valued at $35 in a week. Of this amount, $29 was for food used at home and $6 was spent for food away from home. Of that which was used at home, the average value ranged from $26 in the South to $32 in the Northeast. Most of this food was purchased, but it also included the value of home-produced and donated food.

Meat accounted for the largest share of the food dollar in spring 1965--38¢. Fruits and vegetables combined represented 20¢ of the food dollar, and this was the same share as in the spring 1955 survey, ten years earlier.

Money value and use of apples.--Apples and apple products used in U.S. households had an average value of 32¢ in a week in spring 1965 (table 1). Of this amount, 22¢ was for fresh apples and the remainder for canned apples and applesauce and apple juice, including cider. I should explain that this represented foods reported as apples or apple products because that was the form in which they came into the kitchen. It does not include apples used in commercially baked pies, because they were classified in the baked goods category under "all pies"; however, it does include apples which the homemaker used in home baking and other home preparation of recipes using apples.

TABLE 1.--Fresh apples, applesauce, and apple juice--average weekly money value for household, by region

	Total	Fresh apples	Applesauce	Apple juice
	Cents			
United States	32	22	7	3
Northeast	35	22	9	4
North Central	34	24	8	2
South	25	17	6	2
West	38	25	8	5

The value of these combined apple products ranged from 25¢ per household in the South to 38¢ in the West, per week. Possibly the average level of consumption might not tell you much about your market, because an average is a blending of both high and low level users. Another statistic which we reported for all these food items was the percentage of households using, which may very likely give you a better indication of the extent of use or market penetration for the various categories of apples and products.

Fresh apples.--Fresh apples were used by 45 percent of the U.S. households surveyed in a week in spring 1965. By comparison, 23 percent used canned applesauce (including sliced and other apples) and 6.6 percent reported using apple juice or cider (fig. 1). A slightly greater percentage of the households used bananas rather than apples (fig. 2). Almost one-half

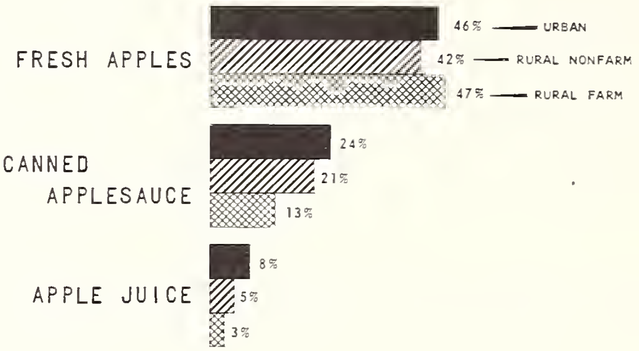


Figure 1.--Fresh apples, canned applesauce and apple juice--households using, by urbanization.

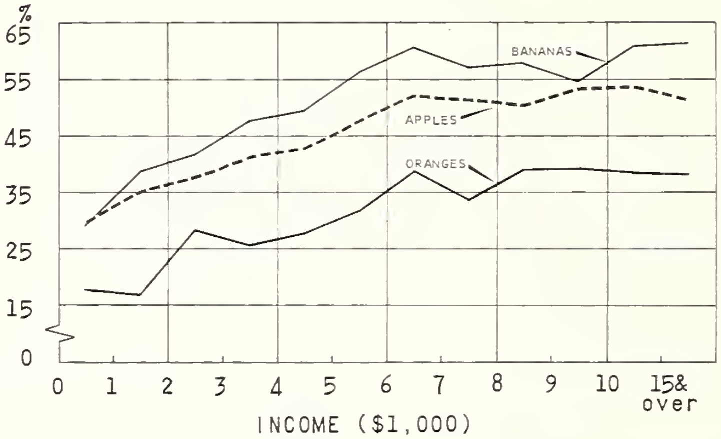


Figure 2.--Fresh apples, bananas, and oranges--households using, by income.

of the households reported using fresh apples, but less than one-third used fresh oranges. Bearing in mind that this was usage during the spring months of April through June, we might expect a greater utilization of apples in the fall and winter seasons after the newly harvested crop is offered in the retail outlets.

Fresh apples were used by a greater proportion of the households with higher incomes than by those in the lower income levels. A similar relationship between income and the families using was observed for bananas and fresh oranges. Above the income range of $6,000-$7,000 a year, however, no particular increase in usage was observed among families in successively higher income levels.

Quantities of fresh apples used in U.S. households averaged 1.38 lb. per household in a week in spring 1965. Adjusted for family size, this represented 0.42 lb. per person (fig. 3). Households in the South used the least fresh apples, averaging 0.35 lb. per person in a week, while the North Central region and the West averaged 0.47 lb. and 0.46 lb., respectively.

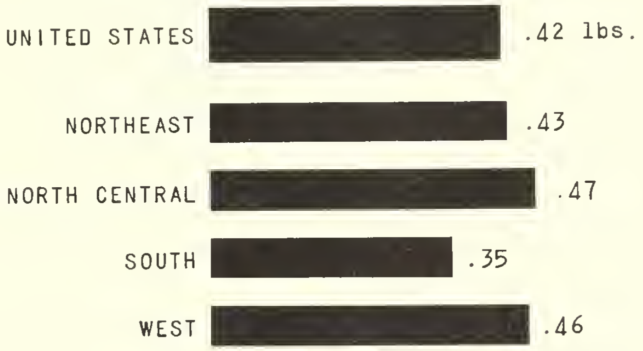


Figure 3.--Fresh apples used per person per week, by region.

Canned apples and applesauce.--Turning now to processed apples, I might point out first of all that our 1965 survey indicated a considerable increase in the use of convenience foods over the 10-year period since the 1955 survey. Processed apple products can indeed be classified as "convenience foods," which may be defined as foods that are at least partially prepared and have some services added to the basic ingredients. Thus, canned applesauce and apple juice are convenience foods because they are fully prepared and ready to serve. Canned apple slices are a convenience food, also, because they are in essence a partially prepared apple pie and need only to be added to the pastry shell.

For some 32 major convenience foods, we found that expenditures increased 34 percent per person between 1955 and 1965. The value of these convenience foods was $8.13 per week in 1965, or nearly one-third of the $27 worth of purchased food used by the average household in a week. You may find it surprising that the greatest increase in the use of convenience foods was found among rural farm households, whose expenditures increased 61 percent per person over the 10-year period.

Canned apples and applesauce, taken together, were used by 23 percent of the U.S. households surveyed. This was about the same usage as for canned peaches, which were reported by 25 percent of the households (fig. 4). It was also well above the figure for canned pineapple, used by 11 percent, and canned apricots, used by 7 percent of the households in a week.

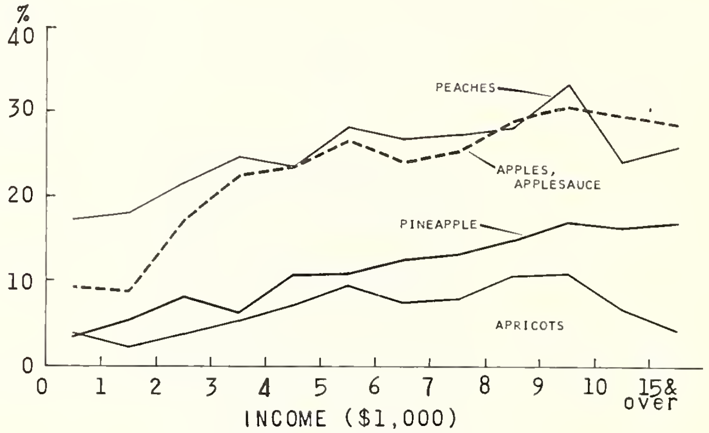


Figure 4.--Canned fruits--households using, by income.

Relating the usage of canned applesauce and slices to income levels of households, it was found that a greater percentage of the households at the higher levels of income used these products, until the $9,000-$10,000 range, after which the usage rate declined. At the other end of the income scale, the chart indicates that the very lowest income households appeared likely to use these canned apple products less than canned peaches. Unless there may be something peculiar about the households in the samples at these particular income levels, I would point out these exceptions to the canned apple usage patterns, by income, for your possible consideration in analyzing the acceptance of these products by households at both ends of the income scale.

The average quantity of canned applesauce and apples used was 0.11 lb. per person per week (fig. 5). This was equivalent to 0.35 lb. per household, or an average of one-third of a #303 can a week. Looking at it another way, when we consider only those households using canned apples and products, the consumption averaged 1.5 lb. per week, or one and one-half #303 cans.

Consumption of canned apples and applesauce was lowest in the South, but there was not much difference among the other regions. Not only were households of higher income levels more likely to use canned apples and sauce, but also, they used greater quantities, at least up to the $7,000-$10,000 income level. Use of these canned items per person in a week was nearly twice as great at the upper income levels as at the lowest income level of under $3,000 per year (fig. 6).

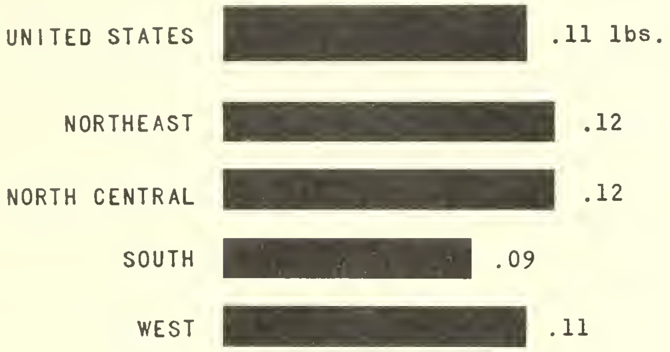


Figure 5.--Canned apples and applesauce used per person, per week, by region.

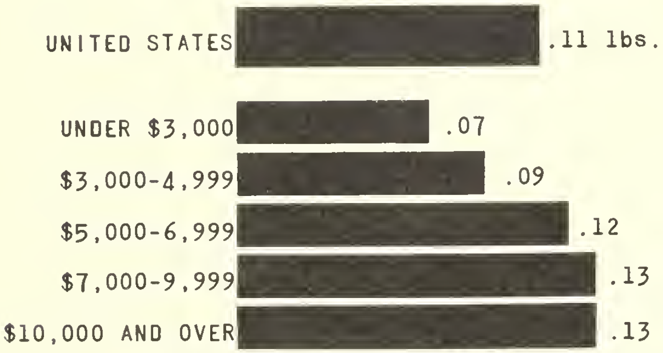


Figure 6.--Canned apples and applesauce used per person, per week, by income.

At this conference I have noticed considerable interest in apple juice. Our data on this product combined canned and bottled apple juice and cider, although as you might expect, particularly in the spring of the year, very little cider would be included in these figures. I will present and discuss the findings in two ways--comparing apple juice with citrus juices, and then comparing it with noncitrus juices. In a way, this gives a picture of its competitive status with breakfast juices as compared with cocktail or appetizer juices.

Canned and bottled apple juices were used by 6.6 percent of the households surveyed in spring 1965. This was considerably less than the 25 percent reporting the use of frozen orange juice in a week and also less than the 11.6 percent reporting the use of canned orange juice; however, it was slightly above canned grapefruit juice, reported by 5.1 percent of the households (fig. 7). At the highest income level, that is households with annual incomes of $15,000 and over, 13.1 percent reported using canned apple juice in a week.

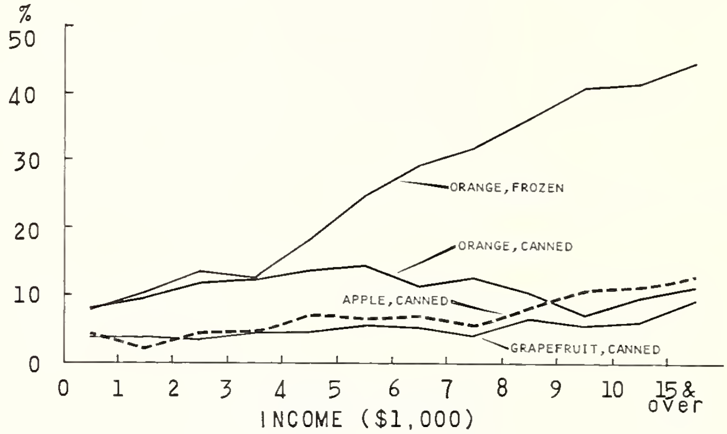
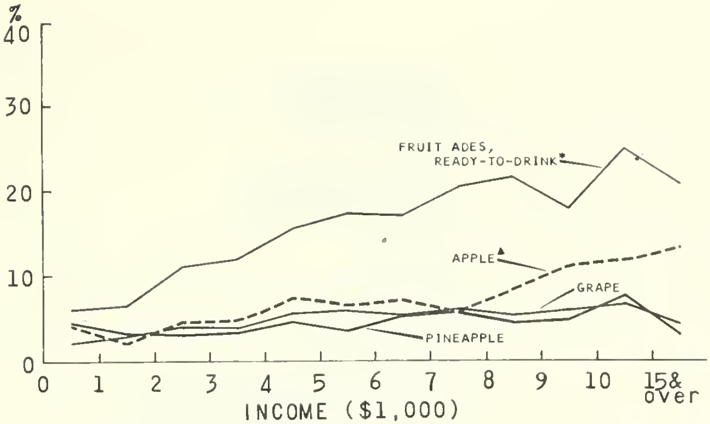


Figure 7.--Apple and citrus juices--households using, by income.

Thus, the question is raised as to whether the upper income households buy apple juice because they have extra money to pay for it, or whether they have different food patterns because of educational or cultural factors and therefore are more likely to include juices of all kinds in their menus. This latter observation is suggested by the strong relationship of income to the use of frozen orange juice. Also, it is indicated in another chart on noncitrus juice (fig. 8). The combined varieties of fruit ades and ready-to-drink fruit punches and nectars were used by 15.6 percent of the households in a week as compared with the 6.6 percent who used apple juice. Grape and pineapple juices were used by less than 5 percent of the households, and whether or not they used it was not strongly related to their income levels.

More regional differences were observed in the use of apple juice than in the other apple products, which I have discussed earlier. The greatest usage was found in the West (which includes all States west of a line from the northern to southern boundaries of the United States and west of the Dakotas and Texas), 11.7 percent of the households in that region reporting



*INCLUDES FRUIT DRINKS AND PUNCHES
▲INCLUDES CIDER

Figure 8.--Canned fruit ades and noncitrus juices--households using, by income.

its use in a week in spring 1965 (fig. 9). Only 4.1 percent of the households in the North Central region and 5.6 percent in the South used it in a week of the survey. Here again, one might suspect a relationship with income, but further analysis showed that at each income level more of the households in the West used apple juice than those in the South and North Central regions.

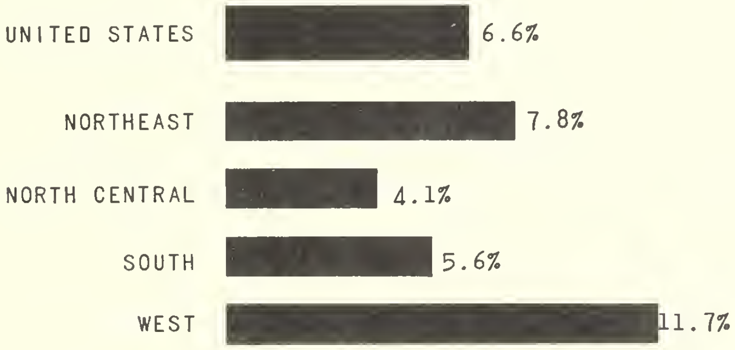
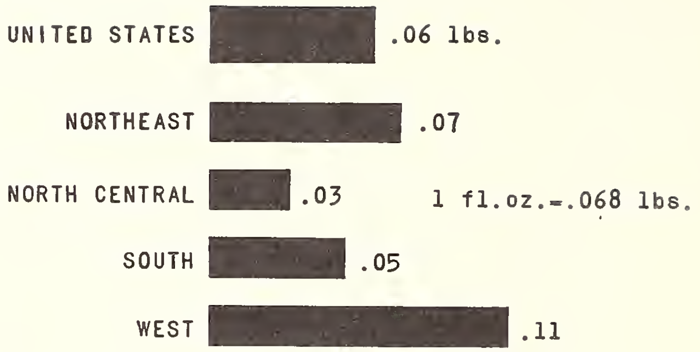


Figure 9.--Households using canned apple juice, by region.

The average quantity of canned and bottled apple juice and cider used was 0.06 lb. per person in a week or 0.19 lb. per household (fig. 10). This is roughly equivalent to 3 oz. per household in a week, expressed as an average of all households, which includes those using as well as those not using it.



1 fl.oz.=.068 lbs.

Figure 10.--Canned apple juice used per person per week, by region.

These have been highlights of some of the findings from our most recent nationwide household food consumption survey, made in spring 1965, with reference to apples and apple products. They may have given you some insight and worthwhile ideas that may be pursued in analyzing the market for your products. For those of you who would like to dig deeper, additional details may be found in our Report No. 1, for the United States, and in the respective regional reports, Nos. 2 through 5, for the Northeast, North Central, South, and West, respectively. Data compiled for the other seasons of the year are still in process of tabulation and will be published in future reports. We welcome your comments and your questions in the hope of assisting you in making use of the findings from these nationwide food consumption surveys.

MARKETING STRATEGY IN APPLE DISTRIBUTION IN THE FUTURE

Max E. Brunk
Professor of Marketing, Cornell University
Ithaca, N. Y.

Everything said here has bearing on the future marketing strategy for apples. I could talk about the strategy of the individual marketer or the broad strategy of the industry. I choose the latter.

I have always been impressed by how long it takes for the industry to realize the benefits from favorable developments. The period around 1950 was highly significant to the apple industry yet no one seemed to know it at the time. Many technological and marketing developments took place around 1950. My purpose in looking back is not to establish a trend for projection into the future. I'm not that kind of an economist. Too many of my good friends have made that mistake. The past has little to do with the future. Despite widespread prediction the disastrous agricultural depression following World War II didn't happen. I take this opportunity to look back only to demonstrate how difficult it is to see what may be happening around us today. I might add that the year 1950 was a most interesting period in apple history.

To refresh memories, here are a few things that happened. For the first time spray thinning became common that year; this greatly stabilized the variation in apple production. A look at a chart showing total annual apple production is impressive. For 16 years before 1950, crop abandonment averaged 11 million bushels; in some years it ran to 20 million. Since 1950, crop abandonment has averaged far less than 5 million bushels. Spray thinning not only made for more uniform qualities but also tremendously affected marketing, by enabling the industry to approach the ideal of producing what could be profitably sold. No industry with widely fluctuating supplies can maintain a strong franchise in the market over time. When the product is not on the shelf consumers buy and eat substitutes, and once their taste for apples wanes, their favor is hard to recapture. Spray thinning did much to alleviate pressures for supply management through marketing orders.

Also in 1950, the first commercial use of controlled atmospheric storage took place. As it developed over the years, it improved the average quality of fruit marketed and extended the marketing season somewhat. Increased plantings of dwarf and semidwarf trees at this time would provide advantages in the years to follow.

On the market side there were three significant developments. Intense competition among food chains following World War II set the stage for the private label expansion which ushered in the 303 can. Applesauce was a natural for the price competition that was to follow. This was also the year that my associate Ben Dominick completed his original research with the polyethylene bag, and that its first commercial use began. It's far from being an ideal package for protecting fruit, but it does sell a lot of apples.

One other significant development took place in my own State during the winter of 1949-50. Dr. Cameron Garman in a single-handed effort stumped the State and "extracted blood from a turnip" for an apple promotion program voluntarily supported by 1,200 New York growers. This ultimately led to an advertising program, following the lead of Washington State.

Very briefly I've tried to show that it has taken a number of developments, a lot of hard work, industry cooperation, and some dedicated leadership on the part of a few people to bring the apple industry to where it is today. One cannot help but wonder whether or not we are as blind to change today as we were nearly 20 years ago when all this was happening. Are there technological, economic, marketing, and organizational changes now in the making which will maintain the vitality of the apple industry in 1975 and 1980? How much did the developments occurring in 1950 grow out of economic desperation? In taking stock today it would appear that the apple industry is living off the fat of the past. Certainly in looking to the future, it is much easier to see the negatives than the positives.

Because our focus at this meeting has been on utilization, we have heard comparatively little about the growing complexities of the labor problems facing the industry. Just as spray thinning had an impact on marketing, the changing labor situation also will have its effect on marketing and the structure of the industry. The labor problem will continue to grow and become more complex each year. It will be more of a factor in some regions than others. Apple growers will struggle to maintain the status quo, but their efforts will do no more than buy a little time to make adjustments.

Historically, agriculture has been relatively unaffected by organized labor and has little skill in dealing with it. The vulnerability of agriculture to labor strikes at harvest time is both apparent and unique. Farmers have been shielded from this problem in the past because of the existence of a plentiful supply of unskilled, migratory labor. Alternative employment and social reforms have cut seriously into this supply, giving the remaining and rapidly shrinking force a bargaining power that did not formerly exist. Organized labor leadership has moved to take advantage of the situation and will with alarming speed penetrate agriculture.

I am a friend of agriculture, and I think I understand agriculture's anxieties and frustrations, but I would be less than candid to claim that agriculture has a uniqueness that will protect it from labor troubles. Over the past year I have heard a number of inflammatory speeches before agricultural groups laying the blame to exploitation by external organized labor leadership, and that public sentiment in the long run will not tolerate strikes that deprive people of the basic necessities of life. As appealing as such arguments might be to an agricultural audience, they simply are not realistic. Not only do such arguments ignore the true cause of the movement, but also they place gross overemphasis on the importance to the consumer of any one producing area or food. At any one time consumers can very easily do without grapes or tomatoes or apples, and we should not hide in false security behind such a shield. Our nation in the past has tolerated strikes of much greater economic consequence than any that would eliminate any given crop from the market.

In the very near future apple growers are going to have to learn to live with an organized labor force, and this will prove to be a most difficult challenge. The ability to adjust and manage such labor will in large measure determine one's ability to stay in business. But the real impact will be on the structure of the industry and on marketing.

I fear that the industry is placing too much hope in mechanical harvesting--particularly of fresh fruit. To a degree this is an effort to preserve the status quo. But today's affluent consumer wants better, not poorer fruit--price is of less and less consequence. Mechanical harvesting eventually may become a reality for the processing market or for some defined part of it, but it is far from compatible with a market demanding constantly improved quality.

Increased harvest labor cost and improvements in mechanical harvesting will soon begin to establish two distinct apple industries--one fresh and one processing. This will appear first in the East where presently much production is geared to the processing market at bloom time. Sales requirements and skills in the two industries are and will become more unique. Accordingly we can expect to see separate organizations serving each industry. Over time, growers of fresh and processing fruit will have diminishing interests in common.

The Northwest will continue to seek the development of a processing market, but realization will be slow because specialized structures already well defined in the East will be tough competition for an industry not geared to a total processing market. Surplus fresh product has never provided a sound basis for any processing industry. In short, I expect to see an increasing proportion of the nation's fresh apple crop coming from the Northwest and an increasing volume of processed product coming from the East. The greatest limiting factor to this development is the relative narrowness of the varietal composition of the Northwest crop. Fortunately, the color and diversity of Golden Delicious reduce this impact somewhat. Keep in mind that I am not talking about regional characteristics of quality or even the suitability of certain varieties and qualities for processing. To the contrary I'm talking only about the impact of a changing labor market.

Fresh market apples in the East will be increasingly restricted to dwarf and semidwarf trees produced under irrigation and cultural practices yielding uniformly high quality fruit. Few orchards in the East meet the requirements. The harvesting will be done by high cost labor which will be paid for out of the higher returns that such fruit will command. Labor saving devices, such as bulk boxes and loading equipment, alleviate the pressure but do not remove it. It could just be possible that a higher quality harvest labor force may eventually prove advantageous to the grower. After all it's not the cost of labor that is important. Rather it is the ratio of cost to returns that keeps a man in business.

Another factor of concern is the impact on marketing of extensive new plantings of apples in all parts of the country. We now have in the ground crop potentials of 175 to 180 million bushels. This year we will produce around 120 million bushels, and if current prices have anything to do with supply, a substantially greater volume could be moved to market. "Scare" sized crops have been in sight for some time, but the weather seems to keep things under control. Even so someday we will have a big crop, and although vast improvements have been made in our marketing machinery, there is no way I know of making people suddenly crave a lot of apples--processed or fresh. Furthermore, no marketing machinery capable of satisfactorily moving a highly variable supply is likely to exist in the future. It is not so much the level of supply as it is the year-to-year variations that give trouble to marketing. I see no trouble in profitably marketing a 175- to 200-million-bushel crop in today's economy if the industry were to gradually approach that level. It is alarming to think about such a crop only in terms of today's supply levels--in terms of a sudden jump. Past variations in supply have made this industry cautious.

Of the two things that have given apple prices strength in recent years, by far the most important is a relatively stable supply that hasn't varied over 4 percent in 8 years. It could well be that I attribute too much stability to spray thinning. Perhaps a long sequence of events happened to bring about a balance over the nation. Even so this stable supply has served to establish a strong market franchise--so strong that it appears hungry for apples.

Secondly, there has been a great strengthening of communication among the major sellers that has harnessed the vicious price rumor mill which used to haunt the industry. This situation was partly the result of a national market information activity, organized and carried out by the National Apple Institute. The idea was not original; it was borrowed from the Northwest. It is only surprising it took so long for the idea to catch on.

But the big concern in my mind is the changing varietal composition of the crop rather than its size. A substantial share of the new plantings all over the country has been Red and Golden Delicious. The past performance of these varieties no doubt accounts for their present popularity. At the same time we should remember that one of the great appeals of the apple--processed or fresh--to the consumer is the wide variety of tastes and uses the apple offers through its many different varieties. People do not want to experience the same flavors day in and out. They like variety, and variety helps differentiate markets. Of course, this is one of the great attributes of the Golden Delicious. Not only does it have distinctive eating qualities, but it offers also a relief in color--gives welcome variation to the vast quantity of red apples on the market. There can be little doubt that this particular variety has served to broaden the market for apples.

Marketability has always been a consideration in variety selection, but it has been subservient to production characteristics--yield, harvest season, storability, hardiness, etc. The consumer and the problems of the one-variety sales organization have been largely ignored. Again I know of no sales strategy that will totally convert consumers' tastes. Advertising has helped and will continue to help, but it can't perform the impossible.

More seriously, the total industry focus on Delicious has put Eastern producers into direct varietal competition with Western producers. And I believe I'm objective in saying that the West has clearly got the upper hand on quality--at least on what most consumers call fresh market quality. This is particularly true with Goldens. The squeeze is beginning to be felt, and in certain sections of the East there is growing talk of the need for greater promotion on Goldens. I think this demonstrates a rather blind faith in the power of advertising, forgetting that advertising pays off best when there is something credible to talk about. I don't know what the solution to this varietal dilemma is, but I rather suspect that an increasing proportion of Eastern Goldens will find their way to the processor, and that this in turn will put greater pressure on a budding processing industry in the West.

In no way should my comments be construed to belittle the importance of advertising. In recent years we have seen advertising programs initiated on a modest scale in a number of areas, and this activity has done much to strengthen the market. But these programs were initiated when prices were lower than they are today, when advertising costs were lower, and when there was less competition in the advertising of other products. With fixed assessments and continuing inflation there has been a gradual dilution of advertising efforts. For example, if assessments under the New York Apple Order were doubled today, the revenues would just about put the industry back to an effectiveness level enjoyed 10 years ago. My point is that the industry continues to slight advertising--particularly advertising on a national level--an activity that can only be effective with total industry support from all regions.

There is one plus factor in that we have learned a great deal about how to use the limited advertising resources we have. Over the past 5 years we have been making systematic studies of our advertising programs in New York. Not only do we have good solid evidence of productive results, but also we have learned how to extend our advertising dollars and use them wisely. We have learned how to space our advertising. We have learned what media to use and what themes pay off best. For example we know that informative themes on varieties and their use are far more effective than humorous, emotional or even health themes. We know that evening newspapers are superior to morning papers, that TV produces more results per dollar spent than radio and the like. We know that apples of a specific geographical origin are best promoted by spotting promotional markets and focusing on them than by trying to sell the merits of apples from a specific State or area. While a much better job is being done with the dollars available, a constantly shrinking proportion of apple crop value is spent on this effort. The apple industry should take a long hard look at the problem and seek ways to keep advertising revenues more in line with crop values than with crop sizes. Likewise we need to seek ways to strengthen national apple programs which are currently operating on poverty level budgets.

In conclusion, I expect the following developments in the marketing of apples in the future:

1. The responsibility for selling fresh fruit will be increasingly concentrated in the hands of larger, reputable sales organizations. Individual grower identity will be lost as small sales organizations go out of business.

2. Sales channels will become more rigid as greater confidence is established between buyer and seller. There will

be a lot less shopping around at the wholesale level. Much selling will be on a standing order basis.

3. The number of brands on the market will be greatly reduced. Established brands will become more important in the identity and maintenance of quality. Service and responsibility relative to wholesale price will become more important. Follow-through in selling will be vital. Personal influence will be a diminishing influence in selling as emphasis on performance and follow-through increases.

4. The sizes and types of packages will be reduced in number and standardized to service specific needs. Prebuilt retail displays will be of increasing importance.

5. Apples marketed fresh will be more of a luxury--will be of increasing quality--and there will be an increasing spread between the prices of fresh and processed apples.

6. There will be improved communications among sellers on a national basis, and this will result in a greater pricing discipline. Pricing in the wholesale market will be less variable as sales organizations learn to work with each other in harmony. Planned flows to market will be the order of the day.

7. There will be far less trading back and forth between the fresh and processing market. More and more processing acreage will be controlled by the processor through contract or ownership.

8. Advertising and promotion will become more vital, and greater emphasis will be given brand and national advertising as State programs recognize the important supportive roles of each.

9. A higher proportion of fresh market apples will come from the West. Processing will continue to be centered in the East.

10. And finally, because time shrinks space, there will be a greater national unity and mutual interest of regions in all forms of marketing. Provincialism, one of the great continuing tragedies of the apple industry, must and will eventually give way to a unified industry.

DEVELOPMENTS IN STORAGE, HARVESTING AND HANDLING OF APPLES IN WASHINGTON STATE

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My remarks will be confined to developments in Washington State. In the last 10 or 15 years we have seen many new developments. Each has had varying degrees of significance but in total they have added up to tremendous change in harvesting, handling, and storage of Washington apples. I believe we are on the threshold of new developments in the next 10 or 15 years which will at least be the equal of those experienced in the past. My purpose today will be to review briefly recent developments. There will be some overlapping in each of the developments, and they will not necessarily be listed in order of importance.

Harvesting

Bulk bins.--The general use of bulk bins has offered particular advantages to the harvest operation. Scattering empties and yarding-out bulk fruit have been speeded and simplified. Pickers find bins easier and quicker to fill. Bruising has been reduced in several ways. Less container surface is in contact with the apples. Bruising caused when overfilled boxes were stacked on top of each other is avoided. Rougher handling of individual boxes in stacking two or three times from orchard to storage is avoided. Bins are kept out from under the trees when filling,which was not always possible with boxes. Bins are cheaper to buy than boxes, have a longer life, and are cheaper to repair.

Tree size.--Several approaches are being made to reduce tree size and keep fruiting wood low to the ground to make the harvest job easier and more efficient. The old, large trees are rapidly disappearing. Tree topping has been used extensively to lower these trees. There are new high-density plantings of dwarf and semidwarf trees. Mold and hold pruning and tree training, such as in the central leader method, are all keeping fruiting wood more dense and closer to the ground. Limited use of trellises has been made. Higher counts per acre of regular trees including spur types are being made, with tree size being controlled.

Mechanical aids.--Many sytems have been tried to speed the harvest and make the work easier. Various types of tree squirrels which put the picker in the tree are being used. The fruit is picked in large, picking bags or conveyed by several methods to a bin carried with the units. Picking platforms of various kinds have been used with some success.

Mechanical harvesting.--There is great interest in future use of mechanical harvesters for fresh market apples in Washington State. Their use in other parts of the country for harvesting of processing apples is being followed with interest. Mechanical harvesting of Washington apples seems quite remote at this time. Much progress has been made. Trial and error and hopefully extensive research will bring its use to Washington some day. There is real fear that shortage of harvest labor will bring its use too soon, that is, before it has been perfected. The result will be a heavy diversion to processing with insufficient processing capabilities available. Economic losses will be significant. Hopefully this will not happen. Pickers may be available, or we will have time to develop markets and processing capacity before the time arrives. Better yet, a suitable mechanical harvester will be developed.

Two varieties to harvest.--Current trees in the ground projected to 1975 production indicate a State crop of 1,100,000 tons of apples. Of this crop 50 percent will be Red Delicious and 35 percent, Golden Delicious. This basic two-variety production will shrink the harvest to a much shorter period than we have known in the past and will have tremendous impact on the available labor and bin and cold storage supply.

Alar.--Fortunately research continues to come to the rescue in part at least. Alar now has the potential for being one of the most important developments to date for the apple industry. Some of the responses reported for Alar are prevention of preharvest fruit drop; increased fruit firmness; delayed watercore development; increased red color; increased bloom; increased fruit set following year after late summer applications; reduced vegetative growth; reduced fruit size; and improved fruit finish.

All these responses cannot be obtained from one rate and time of application, and all varieties do not respond in the same way to Alar treatments. The use of this new tool offers promise which almost staggers the imagination. It will obviously have to be used with great care and skill, but the benefits can well be very rewarding, particularly in the area of extending and helping alleviate harvest problems.

Harvest supervision.--Too many growers fall down in the critical area of harvest supervision. The heavy investment in bringing the crop to the point of harvest can be heavily dissipated by lack of care at this point. Smoothing of rills for cross traffic with filled bins; knocking down weeds for improved working conditions; adequate supervision of pickers to prevent bruising and damage to fruit; courteous, friendly and considerate treatment of pickers; and a good supply of bins properly placed are some of the very important considerations for the retention of pickers and a satisfactory harvest experience. Too many growers spend their time hauling fruit to cold storage and fail to see that all aspects of the harvest are adequately prepared for and maintained during the harvest period.

Harvest labor.--There are several aspects of the harvest labor situation that are a very real cause for concern. There are clear indications that the supply of suitable harvest labor is shrinking. On the plus side even average pickers have been able to make good money picking apples, as we tend to the smaller trees and the Delicious varieties, which run generally to larger sized fruit. Impractical regulations at the State level pose a real threat to the ability of growers to provide needed farm labor housing. The feeling is becoming widespread among clergy and other well-meaning people that unionization will solve the economic plight of migrant and other seasonal farm labor. Liberal and revolutionary elements fostering radical social change are doing all they can to further this philosophy. Naturally big labor is heavily funding and providing professional leadership in the efforts to unionize farm labor. Events surrounding the drive to unionize table grape farm workers in Delano, California, illustrate to what extremes these people will go in efforts to achieve their ends.

Farmers, farm workers, chain stores and consumers have been subjected to coercive tactics. There is need for national legislation especially adapted to the special problems of agriculture to provide suitable ground rules for all concerned in the relations of growers, farm workers, and the retail outlets.

Handling

Transportation.--The use of bulk bins has had a most revolutionary effect as indicated earlier in this report. The use of forklifts at the orchard and plant level is now universal. Special bin-handling orchard trailers have gained fairly widespread use at the orchard level and for short hauls to cold storage. Straddle carriers for orchard-side pickup and delivery to storage are in general use and have proved to be economical, providing a softer ride than conventional flatbed trucks. They have streamlined the loading operations at both pickup and delivery points because they are self-loading and self-unloading. They can work through the night without crews needed to service them.

Scald treatment.--The use of DPA in treatment to prevent scald in long-stored fruit has proved very effective. Equipment has been developed for economical treatment upon delivery just before the fruit is put into cold rooms. Care has to be used to keep the mix at correct levels of concentration with solution change at proper intervals. Lack of attention in this area can lead to much fruit burn and resulting cullage.

Immersion dumpers.--Immersion bin dumpers are now in universal use. They remove the fruit from the bins gently without bruising. The water in these dumpers is usually treated with a material to prevent spore decay, and the dumpers are equipped with leaf eliminators. Bins without bottom board across the main stringers are preferred. They have the disadvantage of picking up dirt and grass in the orchard, which are deposited in the immersion dumper, and thus more frequent change of water is required.

Waxing.--One of the more recent innovations now in general use is fruit waxing. The fruit is thoroughly cleaned, waxed and dried in one continuous operation before reaching the sorting table. Color is highlighted, making sorting easier and more reliable. The fruit takes on luster and better appearance. It lessens dehydration with resulting longer shelf life and appearance at retail.

Electronic sorting.--The technique has been used in a limited way but has not caught on as yet in our State apple industry. Those on which it is used are well sold. There is still promise that it will catch on some day.

Bin fillers.--An almost completely bruise-free method of filling bins in the packing room is available through use of bin fillers. They are very extensively used for graded fruit sorted out at packing time for later packaging. It is a real failure in our industry that they are not also universally used for fruit sorted out for the processors. Juicers and peelers handled through bin fillers return higher yields and a better product. The cost of providing them is relatively small; they should be required by processors.

Poly liners.--The use of poly liners for packed Golden Delicious has been important to this variety. Keepability has been improved, and storage life has been lengthened, with the control of shrivel and the preservation of finish.

Shipping containers.--There is a very real need for research in packaging of our apples. We are going to need more consumer packs in the future. We've got to have a container which will do a better job of fruit delivery to our distant markets. We need a better package but at less cost which can still be stacked high in cold storage rooms. The need for adapting to load unitization and containerization should be a part of our future packaging plans. Our standard tray pack box has too many size manifests. This is costly to the industry in many ways and needs to be corrected.

Storage

There have been many changes in cold storage design, construction, and operation in recent years. Most of these changes lead to better cold storage treatment.

Capacities related to crop size.--Total capacity of cold storage space has increased more rapidly than the size of crops in the last several years. This has permitted general movement of harvested fruit directly into cold storage. It has extended storage life but more importantly has led to more orderly marketing and price stability. Oversupplies moving to market at harvest time due to lack of cold storage space have led to price declines which reached lower levels than the total crop size would justify. Early low prices established retail levels based on these values. Upward adjustments to realistic levels as the marketing season progressed were most difficult to achieve.

Cooling capabilities.--New types of construction, design, and insulation plus heavier capacity cooling units and more flexibility in compressor operation because of improved engineering have greatly increased cooling capabilities. Larger capacity cooling units permit their operation at temperatures close to desired room temperature, allowing for maintenance of higher humidities and resultant moisture retention in the fruit. Attention to proper air circulation has been most important in raising cooling efficiencies and maintaining uniformly desired temperatures in all parts of the cold room. Air curtains over cold storage door openings are in quite general use. This is a great aid to temperature maintenance while loading and unloading. Modern refrigeration compressors, with multiple cylinders which automatically operate as many cylinders as the cooling load requires, have led to additional efficiencies.

Impact of bulk bins.--With the general use of bulk bins, movement of fruit to cold rooms has speeded up. Most growers can keep fruit yarded-out and delivered to the warehouse daily. This has led in many cases to overloading of rooms with resulting slower cooling rates for the fruit. By leaving late afternoon fruit at the orchard pickup location overnight, advantage may be taken of cool night temperatures to lower fruit temperature and reduce the load on cold rooms.

CA storage.--Marketing of Washington apples has been literally revolutionized with the gradual increase in Controlled Atmosphere cold storage to today's capacity levels. It has been particularly adaptable to Red Delicious. This crop is now marketed in an orderly way without being influenced by the development of condition factors. In the pre-CA days, even moderate condition problems after the first of the year often reflected price declines and a demoralized market out of proportion to the actual trouble. A steady market at good price levels has been profitable for the grower and the retailer. The consumer has indicated a willingness to pay for a quality product. In my opinion CA storage has been the most effective marketing tool ever introduced into the Washington apple industry.

What have all of these developments signified as to the utilization of Washington apples?

Washington apples are produced for fresh market distribution. Almost all of these developments have come into being to improve the fresh market outlet.

With increasing crop potential there is greater realization of the need to fully develop the capability in processing. Such a capability in some years could prove to be as valuable a tool as CA storage has been in improving fresh market returns. There are now many new products, particularly in the low moisture and frozen product line, waiting to be market tested. The institutional, manufacturing, and retail outlets are waiting to be fully developed.

There is continued need for more research in meeting and solving the very complex problems we will continue to face in today's rapidly changing environment. The trend toward bigness will continue at both orchard and handler-processor levels. Our whole socio-economic-political and technological revolution seems to dictate this course of events. Orderly progress will require the best efforts of producers, handlers, manufacturers, researchers, educators, government, and industry groups in guiding the technological developments of our apple industry and at the same time relating adequately to the needs of our society.

MECHANICAL HARVESTING OF APPLES AND ITS EFFECT ON PROCESSING

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Widening interest in mechanical harvesting of a great variety of crops and recent successes with other tree crops have seemingly made the eventual machine-harvest of apples for processing a foregone conclusion. Whether or not economies are realized at first seems almost immaterial in the face of an on-again, off-again labor shortage. In the longer term, the need for more efficient and reliable means of harvest seems clear. With that in mind, researchers have been investigating the problems, and some particularly forward-looking growers and processors have been "getting their feet wet" and, to be truthful, "their fingers burned" in some instances. But, all in all, the feasibility of shaking apples for processing has been readily demonstrated.

While stressing that this game, in the early stages at least, is for fruit intended for processing with less stringent demands on quality implicit, the importance to the predominantly fresh-fruit growers of the Northwest should be recognized. Their interest might take two forms: First, the proportion of apples used for processing may gradually increase to the point where they are definitely grown for the processor, as in New York; second, there is a possibility that efforts to reduce harvest costs of fresh apples, through various picking aids, will fall short of economic necessity, causing all apples to be harvested by shaking. In the latter instance, the packing house operation might become more of a separation of the best fraction for fresh pack than of the worst for salvage by the processor. This would represent a change both of emphasis and of relative volumes in the two fractions or grades.

Comparison with hand-pick.--Early investigations at Cornell and then in the field with commercial prototype machines built by C. J. Perry & Son of Gasport, N. Y., showed us that the condition of machine-harvested fruit of the usual firm processing varieties was within the range of apples already being used by the processor. The only direct and fair comparison made between machine-harvest and hand-pick then or since (pitting the Perry prototype against a commercial crew in the same orchard), showed the same slight advantage for hand-picking that we had demonstrated in college tests simulating commercial conditions. In neither case was the difference great enough to cause concern. These results are shown in table 1. We still believe them to be representative of the direction and degree of difference between these modes of harvest as reflected in processing.

TABLE 1.--Direct comparison of hand-picked and machine-harvested Rhode Island Greening apples, 1966

Factors	Method of harvesting	
	Hand-pick	Machine-harvest
Count per cwt.	333	347
Pressure test, lb.	11.9	12.0
Bruise index	88	118
Trim waste, pct.	2.1	2.6
Useable material, pct.	69.6	68.0
Sauce grade score for absence of defects	17.8	17.5

Note that bruise count in this early study is expressed as the equivalent number of 1/2 in. bruises per hundred apples, that none of these bruises were trimmed out in pilot plant preparation of applesauce, and that a Grade A score for absence of defects is 17-20.

Evaluation of commercial machine-harvests.--Made confident by our early tests on machine-harvested apples that commercial operation was potentially successful, we turned our attention, beginning in 1967 and continuing in 1968, to evaluating results in commercial practice. About a hundred bushel-samples were taken from machine-harvested bulk bins in each season and returned to the pilot plant facilities at Geneva for examination. These 201 samples (for the two seasons) represented a dozen different growers, two makes of machines, and all major processing varieties in Western New York.

A few words about the methods used is necessary for an understanding of the evaluation. The bushel-sample was carefully divided into two equally representative subsamples--one for immediate evaluation and the other to be placed in outdoor storage for several weeks (common practice in the processing plants) before a second evaluation. After counting skin-breaks and spoilage on the whole apple, the subsample was peeled to obtain a more accurate and realistic count of bruises. We also determined the useable material remaining after peeling, coring, and trimming out scorable bruises of 1/2 in. diameter or greater. The factors measured are explained further in table 2.

With these factors in mind as measuring sticks, let's make two interesting comparisons. The first is between apples from the two seasons during which the study was carried on at this level, because they turned out to be quite different in two important aspects. The second comparison is among nominally

TABLE 2.--Definition of terms in evaluation of machine-harvested apples

Term	Definition
Count/cwt.	Average number of apples in 100 lb.
Bruise index	Equivalent 1/2 in. bruises/lb. (sizes weighted 1, 2, and 3)
Skin-break index	Cuts and punctures/lb. (steam punctures = 1/2)
Spoilage index	Trimmable spots/lb. (weighted 1 and 2, but discards = 4)
Discards	Fruit too spoiled for mechanical peeling
Useable material	Peeled, cored, and trimmed product as percent of fresh fruit
Trim	Waste carefully removed from bruises 1/2 in. dia. or larger, and any rot except discards, as percent of peeled and cored apple

soft, medium, and hard varieties, at least as so considered in New York. In each case, the tabulated data will be given in two parts, one relating to the evaluation as first performed at harvest and the second pertaining to apples out of yard storage.

In table 3 data are given for the 1967 and 1968 seasons separately, averaging all varieties sampled in a season together, and then as an average of the two seasons representing commercial experience in New York so far. There are two fundamental differences between these seasons, affecting useable material and ultimately processing yield in opposite directions. The fruit was considerably larger in 1968 (by 18 percent), a difference that is always strongly reflected in the proportion of apple

TABLE 3.--Quality of apples harvested commercially by machine in Western New York, 1967-1968

Factors	Time of harvest 1967	Time of harvest 1968	Average of two seasons
Pressure test, lb.	19	18	18+
Count/cwt.	338	282	310
Bruise index	3.5	4.1	3.8
Trim, pct.	1.6	1.9	1.8
Useable material, pct. (at harvest)	70	76	73
Skin-break index	0.6	0.7	0.6+
Spoilage index	0.8	1.6	1.2
Discards, pct.	4.5	11.3	7.9
Useable material, pct. (after storage)	66	69	68
Increase in count/cwt., pct.	1.5	5.3	3.4

remaining after peeling, coring, and trimming. But, on the other hand, conditions in outdoor storage were such during the uncommonly warm period from late September through October that spoilage of fruit that had suffered skin-breaks was much higher--the spoilage index doubled and the discards more than doubled in 1968 over the previous season. This naturally has a pronounced effect on useable material, which takes into account not just apples peeled but those that should have been available had they not rotted. The effect of this spoilage was to cut the nearly 9 percent advantage in useable material (76-70 percent) promoted by larger apples just about in half (69-66 percent). Note that the skin-break index shows only a slight difference between the two seasons, failing by itself to account for the difference in spoilage.

Another interesting fact shown here, though at first seemingly obscure, is the observed increase in count per hundredweight--or decrease in average unit weight of an apple during storage. This figure, averaging over 3 percent for both seasons but markedly higher under the warm storage conditions of 1968, actually represents a loss in weight in the sound fruit. We feel that this does not at all exaggerate the losses experienced under commercial conditions of handling and storage and does suggest an area for improvement.

Finally, the slight but consistent indications of more damage incurred by the fruit in 1968--in bruise index, percent trim, and skin-break index--may reflect the greater numbers of the less sophisticated and less costly machine from which the samples were taken. Many observers guessed that the difference would have been larger.

Soft, medium, and hard varieties compared.--For a few typical New York State varieties, such as McIntosh, R. I. Greening, and Ben Davis, we have accumulated enough data to make some sort of comparison. In a publication directed at a national audience, it may be more meaningful to categorize varieties based on fruit firmness, or more accurately, on a consensus of how well they handle. Indeed, the pressure tests for medium and hard varieties as classified here are not significantly different. But, for the record, our classifications were made as follows, with the number of observations on a variety in parentheses: Soft--McIntosh (40), Cortland (13); Medium--R. I. Greening (48), Baldwin (16), Twenty-Ounce (10); Hard--Ben Davis (28), Rome (11), Monroe (9).

Data on the relative manner in which these three categories withstood machine-harvesting are given in table 4. The differences in average size shown in terms of count per hundredweight are only incidental to the classification and may not hold

TABLE 4.--Damage and processing yield in soft, medium, and hard apple varieties, machine-harvested in Western New York, 1967-1968

Factors	Varieties		
	Soft	Medium	Hard
Pressure test, lb.	14	21	20
Count/cwt.	344	277	317
Bruise index	3.9	4.1	3.3
Trim, pct.	2.0	1.8	1.3
Useable material, pct. (at harvest)	69	76	73
Skin-break index	0.9	0.5	0.4
Spoilage index	1.8	1.0	0.8
Discards, pct.	10.2	7.7	5.5
Useable material, pct. (after storage)	64	70	69
Increase in count/cwt., pct.	3.5	3.4	3.8

for typical varieties in another area. Anyway, damage to the fruit in mechanical harvesting, whether bruise or puncture, does not seem to be related to apple size, at least when damage is expressed on a weight basis. So, while the average size does affect the observed useable material in each category directly, it does not distort the observations on damage.

The three levels of apple firmness, or resistance to handling damage if you prefer, do not differ in equal steps when rated by the factors we have chosen in this study. There is little difference between soft and medium varieties with respect to bruising and the amount of trim necessary to remove it, but a slight improvement is shown by the hard ones. On the other hand, the soft varieties incur twice the skin breaks and spoilage, while in this sense the medium varieties are more nearly the equal of the hard. As in the comparison of seasons, the useable material reflects both size and spoilage. The softer apples, inferior on both counts, provide the least yield of potential product, as well as lower quality. This has led processors to offer less for this class of fruit. But, again we should caution that the results obtained here may not hold for another choice of varieties.

Relationships between variables.--For those who might wish to consider how well certain variables are related, and perhaps to postulate cause and effect, we can offer, in part, the analysis of these 201 observations as provided by our friendly computer. The simple linear correlation coefficient, r, measures on a scale of 0-1 how well a straight line fits the observed relationship. The square of this parameter, r^2, may be particularly useful in estimating how much of the variability in one factor is due to or explained by the variation in the second. In tables 5 and 6 are listed some of the more interesting and significant relationships, starting with some evidence ($r = 0.95$) that subsampling, at least of the bushel-samples brought from the orchard, was adequately done. However, it reflects not at all on the original sampling, except possibly by association, having been done by the same personnel and in the same spirit.

TABLE 5.--Significant relationships among variables in 201 observations from 1967 and 1968 seasons

Variables			Correlation coefficient, r
Sampling			
Count/cwt. (at harvest)	vs.	Count/cwt. (after storage)	+0.95
Skin-breaks			
Skin-break index	vs.	Pressure test	- .57
Skin-break index	vs.	Count/cwt.	+ .28
Spoilage and discards			
Spoilage index	vs.	Skin-break index	+ .44
Discards	vs.	Spoilage index	+ .90
Trimming waste			
Trim, pct.	vs.	Bruise index	+ .78
Trim, pct.	vs.	Spoilage index	+ .40
Processing yield			
Useable material at harvest, pct.	vs.	Count/cwt.	- .84
Useable material at harvest, pct.	vs.	Trim	- .24
Useable material after storage, pct.	vs.	Count/cwt.	- .47
Useable material after storage, pct.	vs.	Discards	- .59
Useable material after storage, pct.	vs.	Trim	- .27

The skin-break index shows a fair negative correlation with pressure test, meaning that as pressure test decreases, the incidence of breaks increases. Surprisingly, a slight (but still significant at the 0.1 percent level--less than one chance in a thousand of error) positive correlation with count per hundredweight turns up, meaning that smaller apples have slightly more breaks per pound, perhaps because of the greater

TABLE 6.--Breakdown by years and two varieties of certain relationships from table 5

Variety or year	Correlation coefficient, r[1]	Variability explained, pct. $r^2 \times 100$
Useable material (after storage), pct. vs. discards		
Variety		
McIntosh	-0.72	52
R. I. Greening	- .47	22
Useable material (after storage), pct. vs. count/cwt.		
Year		
1967	- .52	27
1968	- .38	14
Useable material (after storage), pct. vs. trim		
1967	- .28	8
1968	.32	10
Useable material (after storage), pct. vs. discards		
1967	.58	34
1968	- .89	79

[1] All correlations are significant at the 1 pct. level.

surface involved. Spoilage is shown to be connected to the incidence of skin-breaks, though by a lesser degree of association than expected; and discards prove to be a very major factor in the spoilage index, not surprisingly, since the calculation is so defined.

Considering the factors which affect processing yield, the high correlation of useable material with count per hundredweight shows how sensitive processing yield is to apple size and how much less so to trim. And, the intrusion of spoilage during storage introduces another important factor, mostly at the expense of the influence of size.

A comparison of the effect of spoilage, as between a soft variety, McIntosh, and a medium variety, R. I. Greening, shows how much greater the intrusion is in the former. Finally, this same change of emphasis is seen between the two seasons as greater spoilage caused an increased effect of trim loss and discards relative to that of apple size.

Summary.--We have developed a technique of evaluating apples for processing that seems appropriate to either machine-harvested or hand-picked apples. An estimate of useable material is arrived at along with measurements of several factors that have contributed to it. The latter are helpful in understanding the degree of useability obtained and provide a starting point for improvement. In the two seasons studied, apple size and extent of spoilage were widely different, giving dramatic evidence of the importance of these factors to processing yield. There were also differences in the performance of varieties classified as soft, medium, and hard, the first showing much more vulnerability to skin-breaks and the last, somewhat greater resistance to bruising. Some of the more meaningful relationships between variables have been expressed as simple linear correlation coefficients.

The data reported here represent only the early stages of the commercial adoption of machine harvesting for processing apples. The results, therefore, are limited and yet of special significance. Since the machines have been essentially on trial and operated by inexperienced personnel in orchards not particularly groomed for the operation, the results must to that extent be atypical. But, at the same time, we might guess that the presently experienced apple quality represents a base on which improvement will be made.

NEW CANADIAN APPLE PRODUCTS UTILIZING AN EXPANDING CROP

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Before World War II, Canada was traditionally an exporter of fresh apples with a relatively small apple processing industry consisting of a few drying plants in the Maritime provinces. The cessation of fresh fruit shipments during the war brought about a rapid expansion of dehydration facilities to supply the wartime export market. At the same time a shortage of citrus fruit in Canada led to a considerable emphasis on production and marketing of ascorbic acid fortified apple juice. Much of the early laboratory and commercial development of vitaminized apple juice was done in the late 1930's by the Canada Department of Agriculture.

From 1939, on a number of small Canadian processors, packing canned apple juice with ascorbic acid added helped to make up the deficiency of this vitamin in the Canadian wartime diet.

In 1949 "natural or opalescent" apple juice went into commercial production in Western Canada. This product is made from the McIntosh variety by addition of sufficient ascorbic acid during milling and after pressing to reverse the normal browning reaction. During the process a stable colloidal system is formed which gives the juice its characteristic milky appearance. This is fortified, as are all Canadian apple juices, with sufficient ascorbic acid to leave a residual of 35 mg./100 ml. after 1 year storage.

The proportion of process grade apples made into juice varies from a low of 40 percent to a high of 80 percent in different parts of Canada. With the steady increase of land prices and orchard operating costs particularly in the West, there is considerable pressure upon Canadian apple growers to obtain as high returns as possible from all fruit and particularly from processed fruit. With this in mind more recent apple processing research, particularly at the C.D.A. Research Stations in Summerland, B. C., and Kentville, N. S., has been centered around new and improved peeled apple products. It is felt that these offer the best opportunity for high returns to the producer. Among the items we have investigated are the following:

Canned apple and berry apple pie fillings.--Our object in this development was to introduce a series of fillings with high fruit content and good flavor. In preparation of apple pie filling we used a mixture of 3 + 1 vacuum treated slices and sauce. This comprises 80 percent of the formula, the balance being sugar and thickener. We also found that high quality pie fillings may be prepared by blending applesauce with various berry fruits. Use of applesauce permits a marked reduction in the amount of plant gum or starch stabilizer required. A highly-colored strongly flavored fruit such as black currant may be blended in a ratio of 2 + 3 with applesauce. Up to 35 percent of the total fruit content of loganberry pie filling may be applesauce. For mild flavored pie fillings such as blueberries, applesauce may be added up to the 20 percent level.

Frozen apple crisps.--Frozen apple crisps are one of a family of frozen desserts intended to provide a relatively inexpensive way for a processor to enter the frozen fruit dessert field. The crisps are made by mixing fresh, sulfite-dipped, vacuum-blanched, or frozen apple slices with sugar, thickener and spice. A layer of this mix is filled into shallow aluminum dishes then covered with a topping made of yellow sugar, flour and butter or margarine. The filled containers are frozen. Apple crisps must be reheated prior to serving.

Canned baked apples.--Carefully selected, sized apples were cored then held at 27.5-28.0 in. vacuum for 15 min. We released the vacuum with hot (190°F.) water, holding the fruit in the water until it had taken up enough liquid to sink. The saturated apples were packed into cans. The cans were filled with sugar syrup at 45 percent total soluble solids, closed using steam flow and retorted, the process for a 19 fl. oz. (307 x 409) can being 25 min. at 240°F. While retorting is not necessary to achieve commercial sterility, it gives a desirable texture to the finished product. Container specifications must be varied with the variety processed. Green-skinned fruit such as Newtown may be packed in plain cans. Red-skinned varieties should be packed in lacquered cans or glass.

Frozen baking apples.--Frozen baking apples are prepared by a similar process. Selected apples are cored and vacuum treated in the same way as fruit intended for canning. In this case we released the vacuum with 25 percent sucrose syrup, heated the syrup to 190°F. and held the fruit for 5-10 min. in the hot syrup to inactivate enzymes and achieve a softer texture. The treated apples were then cooled and frozen. A number of core cavity fillings have been assessed in pilot plant trials. Fillings which contained any quantity of sugar have been found unsatisfactory as water movement by diffusion causes syrup formation in the core cavity at normal frozen food storage temperatures. This is unacceptable in commercial shipments of frozen food. For a good quality frozen baking apple we selected sound fruit at optimum processing maturity. Over-mature fruit undergoes excessive shriveling during blanching. Red Rome and Golden Delicious were found to be best among the varieties tested. Poor color made McIntosh and Spartan unacceptable.

Continuous vacuum process for canned solid pack apple slices.--Vacuum removal of gas from apple slices before canning has been a batch process for more than 40 years. Now it may be done in continuous equipment jointly designed and built by C.D.A. (our laboratory) and the Ellett Copper and Brass Co., Ltd., of Vancouver, B. C. Each of presently installed continuous vacuum units consists basically of a 60-in.-diameter vacuum tank set above two water filled "legs" more than 32 ft. high which act as hydraulic vacuum seals when the system is operating. Apple slices from conventional peelers and sector cutters pass over a shaker screen to remove slivers and then drop into the feed sluice of a 4-in. open impeller pump. This pump, with variable speed drive, can circulate up to 150 g.p.m. of water and is adequate to move up to 4 tons per hour of slices to a single vacuum unit. The slices and water are pumped to the top of the vacuum chamber. Here the slices are separated from the circulating water by means of a sloping rod screen. Water is bypassed to the bottom of the vacuum chamber while the apple slices are fed into the top of the chamber. Inside the chamber the slices fall into one segment of an open-ended cylinder. The cylinder, divided into eight segments by perforated partitions, is mounted on a central shaft and is turned by a hydraulic drive. The drive, controlled by a timer turns the cylinder through one-eighth of a circle and brings an empty sector into position for filling. After a filled sector has been turned through three-fourths of a circle it aligns with the discharge chute which feeds the now evacuated apple slices into the 6-in. outlet leg. In the discharge leg, apple slices and circulating water mix and flow down and out of the system through the S-shaped trap at the bottom.

Treatment time in the vacuum chamber may be varied from 5-15 min. Normally, 10 min. at a vacuum of 28 to 28-1/2 in. is sufficient to remove gases from the intercellular spaces of the apple slices. Vacuum treated slices may be discharged over a dewatering screen into a continuous hot water blancher. A 2-1/2- to 4-min. blanch prepares them for filling as canned solid pack.

Continuous vacuum sulfiting for frozen slices.--The continuous vacuum equipment described may be used for sulfiting apple sectors prior to freezing. In this process apple sectors are conveyed for 5 min. through a tank containing approximately 1/8 percent sulfur dioxide. The slices are then transferred into the feed pump of the continuous vacuum system. After 8 to 10 min. in the chamber under 27-1/2 to 28-1/2 in. vacuum the slices are automatically discharged, separated from the continuously circulating vacuum system seal-water, and transferred into a post-vacuum dip tank containing 1/80 percent sulfur dioxide solution.

The evacuated slices quickly become impregnated with sulfur dioxide solution. After 3 min. in the post-vacuum dip and a total process time of 16 min., slices are ready for immediate freezing.

Dehydrofrozen (sulfite free) slices.--Dehydrofrozen apples were first developed by the U.S. Department of Agriculture. We have modified the original process to eliminate sulfur dioxide from the product. In our process apple sectors are vacuum-treated 8 to 10 min., blanched 3 to 4 min. in 185°-195°F. water, dehydrated to 50 percent of wet weight in a hot air drier at 180°F. The partially dried fruit is cooled, packaged, and frozen. A further advantage of this modified process is that additives such as sugar, acid, calcium salts, and flavorings may be dissolved in the blancher water and subsequently distributed through the product being processed.

Frozen "pourable" applesauce.--A new type of sauce product is frozen unsweetened applesauce in particulate form. This was prepared by extruding cooked sauce from a fine nozzle approximately 1/8 in. in diameter into a liquid freezing medium. We used a bath of Freon 12 to achieve almost instantaneous freezing. Appearance of the frozen sauce is similar to cottage cheese curd. The frozen sauce is readily dispensed from the package and retains the color, flavor, and aroma of fresh cooked sauce.

Jellied applesauce.--Among the simpler product modifications is canned jellied applesauce. This product contains about the same amount of sugar as normal applesauce and is set up in a gel with low methoxyl pectin and added calcium salts. We added citric or malic acid to raise the titratable acidity to 1.0-1.2 percent thus making it possible to use any variety of dessert apples in this product. Finished soluble solids may be varied from 21 to 27 percent. Our taste panels find that a soluble solids to acid ratio of 22.5:1 is most acceptable. Artificial food dyes may be used to add a note of color. This is particularly desirable when the product is served as a garnish with meat dishes. We have also blended applesauce with other fruit purees and jellied them with low methoxyl pectin. High scoring blends were apple-black currant (2 + 1) and apple-cranberry (4 + 1).

Drum dried apple-berry sauces.--Other applesauce products included a series of dehydrated apple-berry sauce blends similar to the instant applesauce, described by Lazar and Morgan. We prepared these by blending applesauce, usually made from Red Delicious variety, with berry purees. The blends were dried on a double-drum dryer with clearance set at 0.006 in. Mixtures of apple-blueberry (1 + 1), apple-raspberry (2 + 1), apple-strawberry (2 + 1), and apple-cranberry (4 + 1) have been prepared.

Drying conditions were essentially the same for all blends. The products were dried in approximately 20 sec. at 307°-324°F. Final moisture level in all products was 2 percent. Sufficient potassium metabisulfite was added to each blend to give 400 p.p.m. total sulfur dioxide before drying. This preservative prevented browning during drying. Final total sulfur dioxide content of dried flakes averaged 60 p.p.m. Yields averaged 12.5 lb. of dried flakes for every 100 lb. of fresh sauce.

Color stability of the dried products is good with glass packed products stored in air showing no detectable color loss during 1 year at ambient room temperatures of 65°-80°F. Flavor loss during storage is a problem, and our experiments to date indicate that packing in a nitrogen atmosphere may be necessary.

Apple-berry flakes may be used as a dry ingredient in cake mixes and icings; partially reconstituted to 65 percent soluble solids as sundae toppings; or as completely reconstituted sauces.

We have also made an interesting series of compressed dried fruit discs which may be used in breakfast cereals or as a candy bar filling. Flakes were wet granulated by adding 16-18 percent of a 25 percent w/w sucrose solution. Granules were dried at 180°F., cooled, reground, and compressed in a tableting press.

In addition to the apple-berry blends, a 1 + 1 blend of applesauce and banana puree was dried, granulated, and compressed. This product has a similar appearance to a freeze dried banana slice and is particularly appetizing with dry breakfast cereals.

The main advantage in blending apple with these products is the improved drying characteristics of the blends compared with some unmixed berry purees. For example while blueberries have sufficient dry matter content to dry satisfactorily without the addition of applesauce, strawberries and raspberries form an extremely gummy sheet that is difficult to remove from the drum and does not flake well when cooled. The addition of applesauce overcomes this problem.

ROLE OF PROCESSING IN THE MARKETING OF APPLES

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To many, the term economics means relative costs, that is, how does the cost of freezing apples compare with the cost of drying, and so on. I'm sure those in the apple industry believe this concept is much too restrictive and leaves out many factors that are important in determining the economic merits of a process or product.

I shall discuss apple processing more in terms of the definition given in Merriam Webster's Collegiate Dictionary: *Economics. The science that investigates the conditions and laws affecting the production, distribution, and consumption of wealth; or the material means of satisfying human desires.*

If we consider just the last part of that definition, "satisfying of human desires," we can see two important areas to be fulfilled. The first concerns the apple industry. The grower is in the business to make a living, to earn a profit; the processor, distributor, and all the others directly concerned with apple production and marketing are also working to earn a living and make a profit. Their desires thus become satisfied best when the profit is the highest.

The second area of human desire concerns the consumer of apples. The housewife is striving to feed the family with a diet having nutrition, quality, variety, appeal, convenience, and low cost. Her desires concerning apples are satisfied best when the apples and apple products she buys contain the best combination of quality, convenience, and low cost.

Obviously, there is no single apple or apple product that does all these things for all concerned. One hundred years ago, the grocer sold and the consumer bought only one item, fresh apples, and maybe a little hard cider, although even then there was the complication of different varieties and differing qualities according to the season.

Today over 40 percent of the apples are processed in many different ways, and fresh apples are greatly improved for year-round sale by the better methods of storage and handling. Before we consider products and processes, let us first review the role processing has had in the marketing of apples and then attempt to project its role into the not too distant future. Then we shall have a better basis on which to judge the economics of the various processing methods.

Inelastic demand for fresh apples.--The grower would probably prefer that all his apples go to market as fresh, because the farm price for fresh apples has averaged two to two and a half times as high as for processing apples, nationwide. Two factors, however, limit the number of apples that can be sold fresh.

First, all apples produced are not of adequate quality to bring high prices as fresh. They may be bruised or damaged; they may be misshapen or too small or too large; they may have poor color; and they may even be a variety not too well liked by users. So if the grower can't sell these apples to the fresh market, sale for processing even at a fraction of the fresh price may be quite satisfactory, because his total return will be increased. This assumes, of course, that the sale of the processed product will have but little effect on the sale of his fresh apples. Furthermore, the inputs and returns from the processing industry are very important to the economic activity of the community.

The second factor that has provided a million economists with a zillion opportunities for analysis is that offering too many apples for fresh sale severely depresses prices. If the proportionate price decrease is greater than the proportionate supply increase, the demand is called inelastic. In the case of fresh apples, most analysts seem to have concluded that with a given set of conditions, selling, say, 1 percent more apples fresh depresses prices more than 1 percent, so that total return is actually decreased by the additional supply.

Smith Greig showed that at retail a 10 percent change in the price of fresh apples is associated with a change in demand of only 3-1/2 percent in the opposite direction (fig. 1); thus, the more fresh apples sold, the lower total returns. On the other hand, Greig found the demand for processed apples quite elastic. A 10-percent change in the price of applesauce results in a 44-percent change in the quantities demanded. For juice, the same price change results in a 23-percent change in demand. The analyst is impressed with the fact that this represents a demand elasticity of -4.4 and -2.3. It shows that a lot of applesauce and juice can be sold if the price is right. So applesauce and juice are excellent examples of products that can use lower grade fruit and at the right price can command large volume.

Historical trends.--From data in "Agricultural Statistics" for 1962 and 1968, I prepared some graphs showing how processing has performed one of its functions, that of diverting apples from fresh sales to the benefit of the grower and thus satisfying his desire for higher income. Data are 4-year moving averages and price data are corrected for inflation. In figure 2 we see that since the mid-forties, apple sales have increased nearly 30 percent. However, this increase did not go into fresh sales. Rather, it was entirely absorbed by processing, which increased about 80 percent.

With a growing population, per capita sales are more meaningful in determining prices than are total sales, so per capita data are shown in figure 3. Now we find total sales remaining stationary since the early fifties and fresh sales declining. Quantities processed increased about as much as fresh decreased. In figure 4 we see that the proportion of apples processed has increased significantly, from 25 to nearly 45 percent. Even from 1950 the growth from 30 to nearly 45 percent is a 50-percent increase.

How quantities processed change in relation to total apples sold is shown in figure 5. In this chart annual data are plotted. On the X-axis are the percent changes from the previous years' total apple sales, and on the Y-axis are the percent changes in the quantities processed. A line of fit drawn freehand indicates that a 10-percent increase (or decrease) in total sales is accompanied by a 16-percent increase (or decrease) in apples processed.

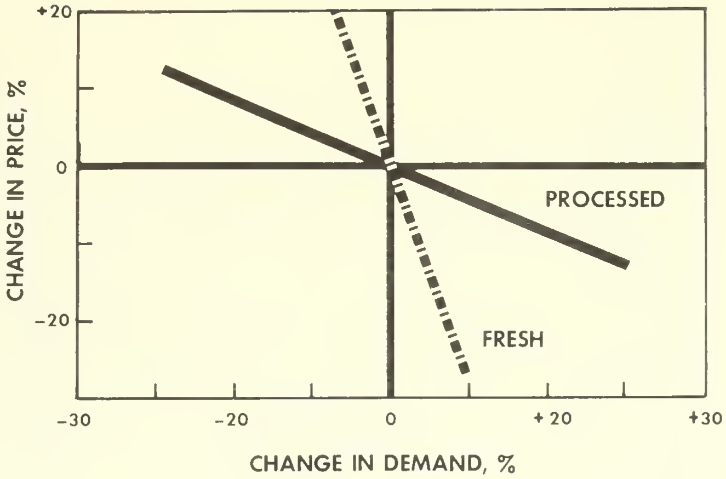


Figure 1.--Elasticities of demand for fresh and processed apples.

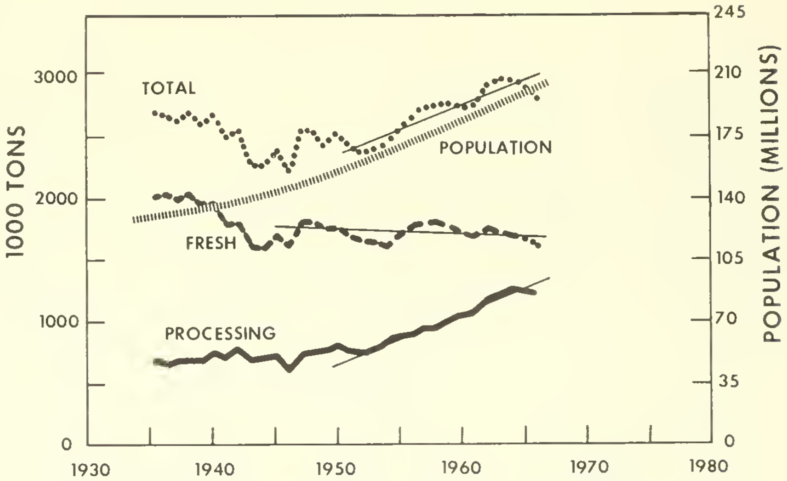


Figure 2.--Apple sales and disposition--1934-1967.

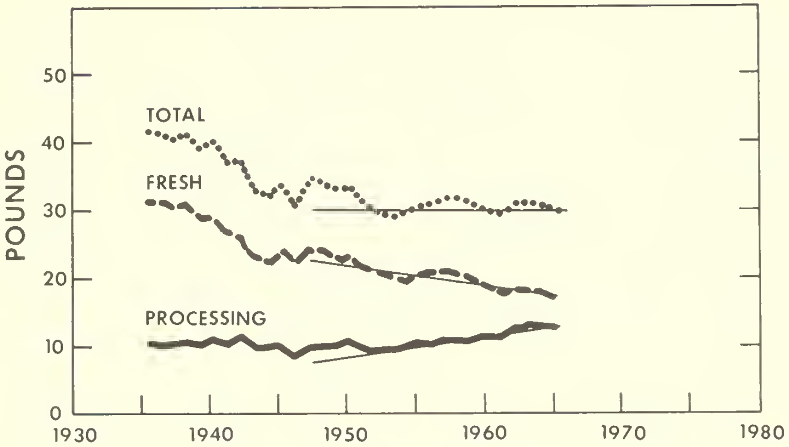


Figure 3.--Apple sales, per capita--1934-1967.

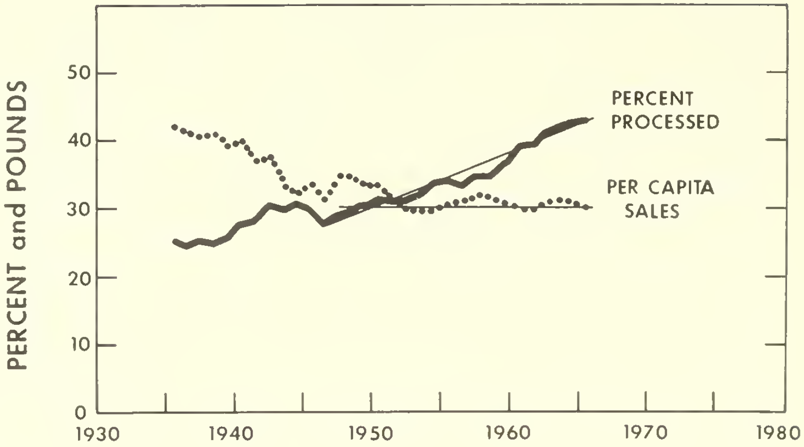


Figure 4.--Proportion of apples processed--1934-1967.

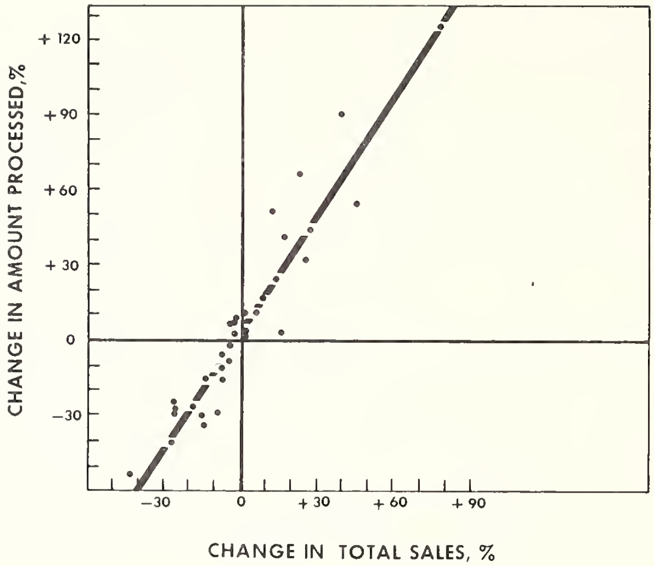


Figure 5.--Changes in quantities processed in relation to total apple sales--1934-1967.

We know many other factors also influence the quantities processed, but even so, the relation between total sales and processing remains quite evident in figure 5.

With stable total per capita apple sales, declining fresh sales, and increasing processing, what has happened to prices? In figure 6, we see a steady rising price trend, even after correction

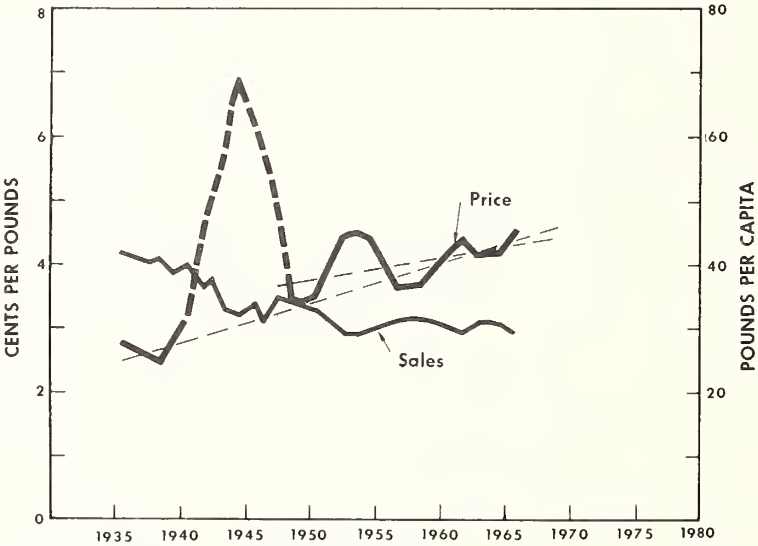


Figure 6.--Per capita apple sales and farm prices--1934-1967.

for inflation. (The war years must obviously be excluded from consideration.) This trend is helping to satisfy the grower's desires, provided his unit costs haven't increased as much or more than prices.

But the real impetus to rising apple prices is more clearly seen in figure 7. The analyst's dream of perfect correlation is

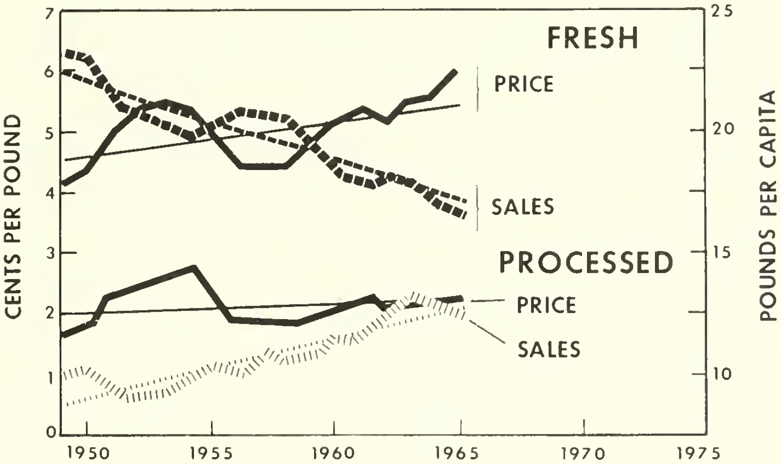


Figure 7.--Per capita apple sales and farm prices for fresh and processed--1948-1967.

seen in the obvious relation between per capita fresh sales and farm prices. The cyclical variations in price appear to correlate inversely with fresh sales. Whether or not the rising trend in prices is caused by the downward trend in sales or by other factors, such as rising incomes, is less certain. The 1965 "Household Food Consumption Survey" reports that the money value spent per household for fresh apples increases as incomes increase but appears to reach a plateau, or even decreases slightly, at around a net family income of $9,000 a year. Tomek refers to this by saying, "...per capita fresh apple consumption first increases and then decreases as income increases." While the effect of income on fresh apple prices appears somewhat uncertain, one could infer from figure 7 a definite relationship between the downward trend in fresh sales and the upward trend in prices. These relationships are especially significant when one considers the impact of the larger apple crops that are forecast for the future. What will the price trend do then?

The lesser degree of correlation between the amount processed and prices can be explained by the relatively greater importance of other factors such as carryover, orange concentrate prices, etc. The "Household Food Consumption Survey" found less relationship between canned apple sales and purchases by income groups. The greatest purchases of canned apples are over a broad range of incomes above $5,000; below $3,000, purchases are considerably less. Apple cider sales, however, increase as incomes increase. It would appear that generally the sale of all apples, whether fresh or processed, is fairly closely related to income, and thus apples are probably considered by homemakers in the basically nonessential group of foods. Families in the $15,000 plus income level buy nine times more apple cider, 30 percent more canned apples, and 70 percent more fresh apples than families in the $3,000 bracket.

In figure 8, fresh sale and price deviations from the trend lines are plotted. The line of fit, drawn freehand, shows that

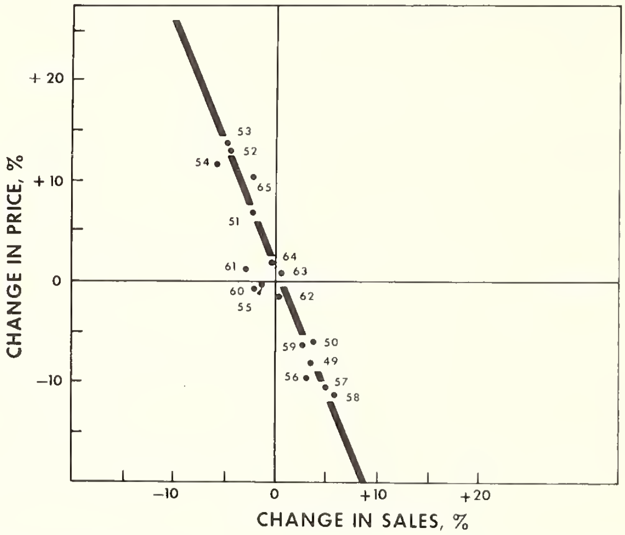


Figure 8.--Deviations from trends of farm prices of fresh apples and sales--1948-1967.

during the nearly 20-year period from the late forties to the present, a 10-percent deviation from the trend line of per capita fresh sales was accompanied by a 25-percent deviation in the opposite direction from the price line, a most inelastic situation.

Projection to 1975.--What can we predict for the future? Several projections are possible. We can assume existing trends will continue or we can accept the 1975 projection by the American Can Company of about 175 million bushels, or 4.2 million tons. Because my data are on the basis of apples sold (after farm home use), I'll use a figure of 4 million tons. We can further assume two different possibilities concerning disposition: (1) That the illustrated 10-percent increase in sales results in a 16-percent increase in processing, and (2) that by some miracle, per capita fresh use will not continue to decline.

An extension of current trends to 1975 is illustrated in figure 9. A total of 3.3 million tons is indicated by 1975. Fresh and processing are equal at 1.65 million tons, and processing accounts for 50 percent of apples sold. Such a total gives per capita sales as shown in figure 10--a stable total sales, declining fresh, and rising processed. The effect of such per capita fresh sales on prices is shown in figure 11. We can predict rising prices for fresh apples if other factors that have a bearing on prices also maintain their past trends and effects. Processing by 1975 would absorb about 400,000 more tons of apples, an increase of 32 percent.

In figure 12, we see the effect of an increase in total sales to 4 million tons. Here it is assumed that the rather flat trend in fresh sales can be maintained. Hence, processing expands to 2.35 million tons, for an increase of 1.1 million tons or 88 percent. The effect on per capita sales is shown in figure 13. Processing then takes 58 percent of all apples sold. The effect on fresh apple prices should be about as shown in figure 11, provided the additional production of apple products does not compete with fresh sales.

The last assumption is based upon the previous analysis which indicates a 10-percent rise in total sales is accompanied by a 16-percent increase in amount processed. Figure 14 shows processing expanding to 2 million tons for an increase of 750,000 tons. Fresh sales grow to 2 million tons. On a per capita basis (fig. 15), fresh sales break the magic downward trend and expand 3 lb. to 18 lb., or 20 percent above the previously established trend.

We have already seen that a 10-percent variation from the trend results in a 25-percent change in price in the opposite direction. If this relationship still holds true in 1975 and is linear to 20 percent, price decreases by 50 percent below the 6 cent price expected for 1975 (fig. 16). It is unlikely, however, that the relationship is that linear up to a 20 percent change in sales. The relationship calculated in figure 9 is based upon a maximum deviation from trend of about 6 percent. Whatever the exact relationship, however, it is likely that an increase in fresh per capita sales to 18 lb. will be accompanied by lower prices.

With a fair certainty that total apple sales will increase to the projected 4 million tons, and with a like certainty that

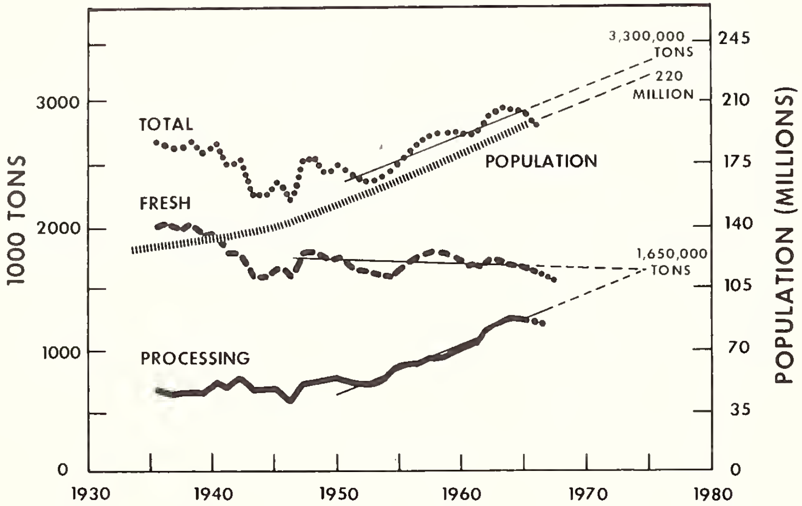


Figure 9.--Apple sales and disposition--projection of present trends to 1975.

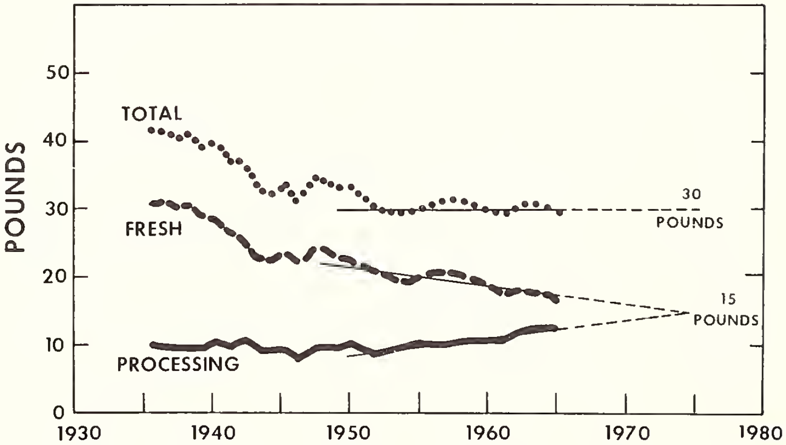


Figure 10.--Apple sales per capita--projection of present trends to 1975.

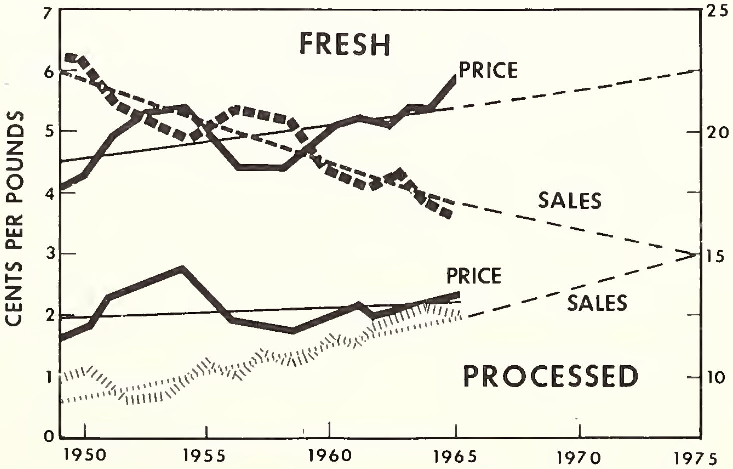


Figure 11.--Apple sales and farm prices--projection of present trends to 1975.

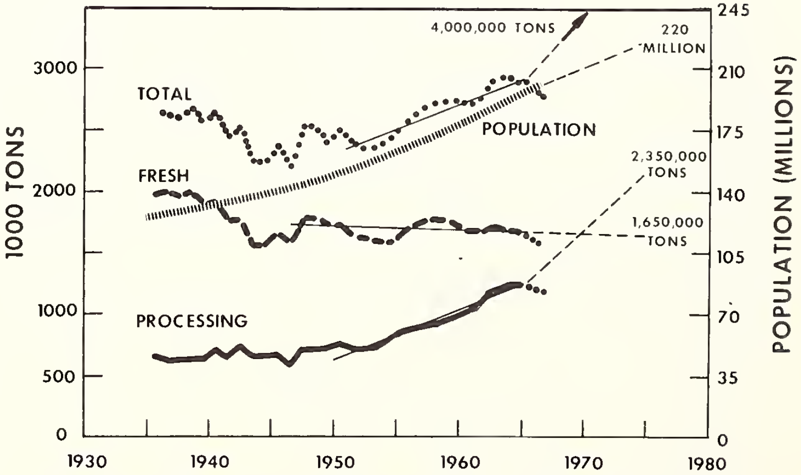


Figure 12.--Apple sales--high projection to 1975 (assuming a continuation of present trends in fresh sales).

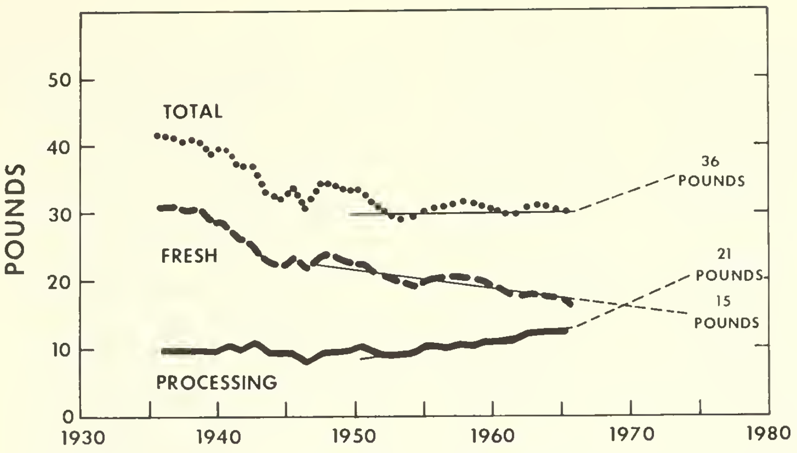


Figure 13.--Apple sales per capita--high projection to 1975 (assuming a continuation of present trends in fresh sales).

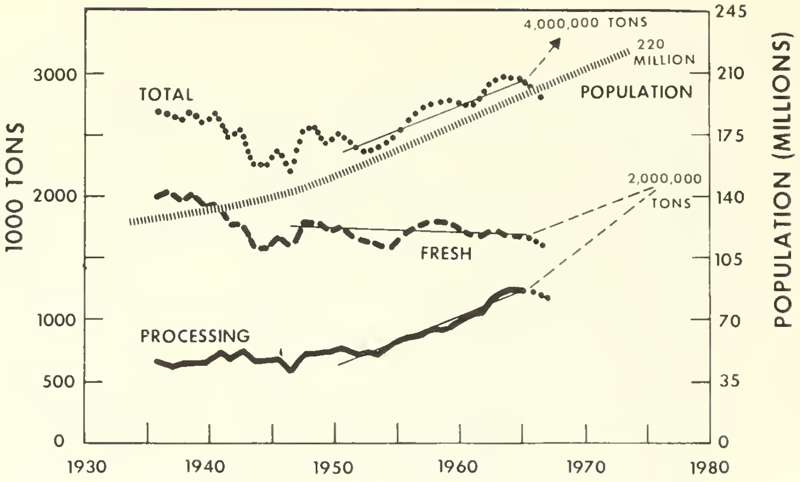


Figure 14.--Apple sales--high projection to 1975 (assuming 10 pct. increase in sales increases amount processed by 16 pct.)

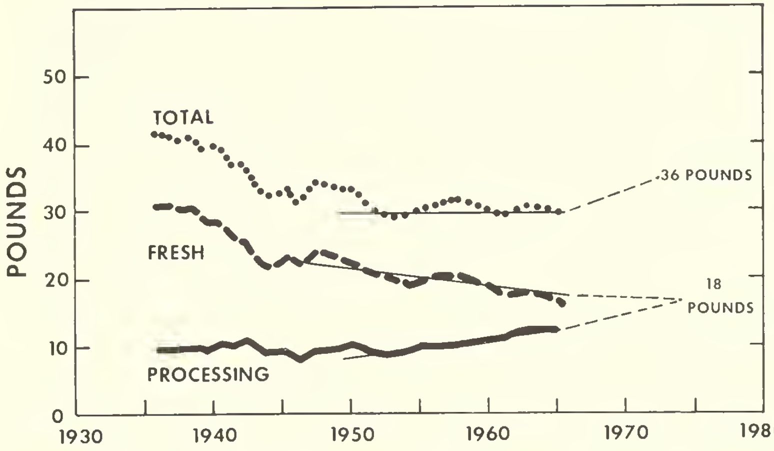


Figure 15.--Apple sales per capita--high projection to 1975 (assuming 10 pct. increase in sales increases amount processed by 16 pct.)

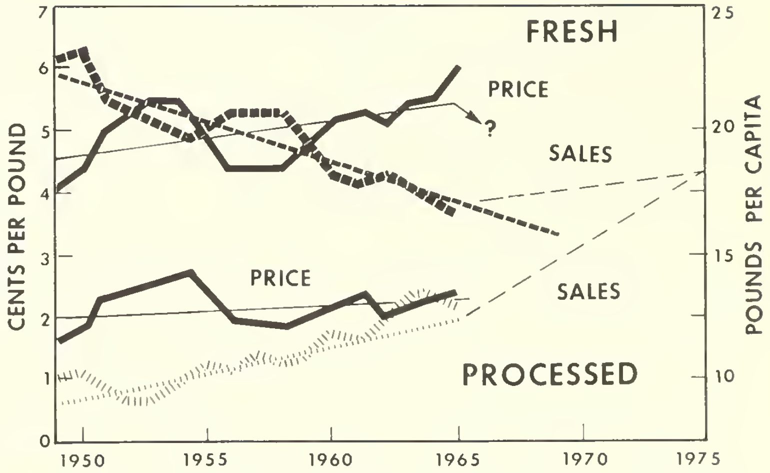


Figure 16.--Apple sales and farm prices--high projection to 1975 (assuming 10 pct. increase in sales increases amount processed by 16 pct.)

increased fresh per capita sales will result in lower prices, the task of apple processing is obvious. We could hazard the prediction that by 1975 one million more tons of apples will have to find outlets in other than the fresh market, and in outlets that will not compete with the fresh. If the apples can be exported, fine. And some will be. But in all probability, processing will get most of them. The extent to which processing is able to absorb the additional million tons of apples or at least its share after exports will determine to a major degree what the price trend will be for fresh apples. If processing fails this task, then it is obvious that the grower's desires of good income and profit may not be reached. If processing can help maintain the increasing fresh price trend, then the cost of raw material to processing will assume a different importance than if fresh prices decline. Processing, in the latter case, must pay a higher proportion of growing costs.

We have seen in figure 1 that the retail demand for processed products is quite elastic. Thus the consumer has indicated a willingness to buy many more apple products if the price is right, which to her means low. Processing has its job cut out for it, especially since the emphasis must therefore be on products selling at relatively low prices to utilize all the quantities visualized.

Consumer's desires.--In applesauce and apple juice, two consumer requirements are obvious--convenience and reasonable cost. Both products are "instant" in the sense that they are ready for serving the moment the container is opened. Hardly anything could be more convenient.

I do not have adequate price data to compare the costs of buying apples and making sauce and juice in the home with the prices of the processed products, but for many consumers in many parts of the country and during many weeks of the year, canned sauce and juice must be considerably cheaper. Furthermore, few people indeed have ever made apple juice at home.

Product price.--The price of a processed product to the consumer is an accumulation of a long chain of costs compressed into a single price tag. Prices differ as products differ, as distances from supply vary, as basic processes differ, as container requirements change, and as raw material requirements vary. Any product that can command a price high enough to cover all costs must be considered an economic success. If the price is relatively high, however, that product may not contribute more than a very minor part to the total market for processed products necessary to achieve an economic success for the entire apple industry.

An economic analysis should contain the following elements: end product desire, quality demanded, raw material suitability for the product and process, basic process costs, packaging requirements, distribution and storage costs, and mark-ups all along the line from grower to user. Each product will have its own combination of these factors. Unless we rate them all, we cannot judge the economic status of a product. And in addition to these costs which are directly related to product and process are the intangibles of administrative, financial, and selling costs. Sales costs for a new product or a product of limited volume would presumably be high. These, of course, are reflected in the selling price but are not factors directly related to the product or process.

It is important, initially, to consider the matter of the product desired. Apparently, each need requires a certain product or type of product. If that need requires a product using a high-cost process or a choice of high-cost products, then the cost comparison must take this into account. If convenience is the goal, then we must judge comparative costs in that light. A special quality may also be a goal.

We could say freeze-drying is too expensive a way of dehydrating foods. But this is meaningless if we don't consider the intended market and the price that market justifies. In a military use, freeze-dried meat might prove the most economical product. It is light, easy to transport and store, and has high acceptability. Air-dried beef can be produced at a lower cost, but if no one eats it, the cost per unit of nutrition becomes exorbitant. New processes for air-drying, however, have been developed for significantly better quality. Canned beef also costs less to produce than freeze-dried, but the costs and logistics of storage and transport in many instances may make the canned product uneconomic. Who would question the addition of a few pieces of freeze-dried chicken (even at a cost of $4 to $5 a lb.) to a dry soup mix so that the cooked soup will contain real pieces of chicken meat, an obvious sign of quality? With the thought, however, that we are looking for ways of utilizing another million tons of apples, we must recognize that the high-cost specialized products will represent only a small fraction of the total.

In figure 17, I have categorized the main factors in product costs in a "cost triangle." In the three corners are the three basic and pertinent cost factors--raw material, process, and distribution. In the center is another cost factor--administrative, financial, and selling--which, as we have noted, is not directly related to product, but nevertheless becomes a part of the final sales price. Not a single cost factor stands alone. All are entwined with others. Our cost triangle is somewhat like an inflated inner tube--poke a finger into one spot and the tube bulges out every other place. Stress it enough, and it may even pop.

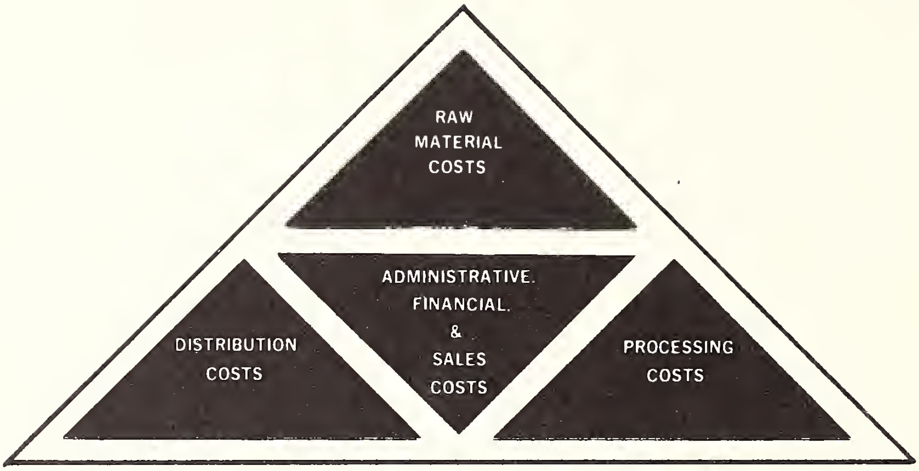


Figure 17.--The cost triangle.

Raw material costs.--All processes require sound, uncontaminated fruit. But thereafter, requirements may vary. This variable requirement is the basis for separation of raw material into various sizes and kinds of apples. Making juice products probably represents the lowest requirement for fruit appearance. Just about any kind, size, and shape of sound apples can be used. Hence, raw material costs for juice should be about the lowest for food grade apple products. Sauce, also, can use a wide range of raw materials, because in the process, appearance defects are largely eliminated.

Slices and rings are several steps higher in requirements because of excessive trimming costs and losses if fruit is too small or has many defects, and because the slices should be properly shaped. Diced products and wedges also require careful trimming to avoid blemishes not taken out in subsequent processing.

Basic fruit quality, such as texture, acidity, color, also is important in the end product. Certain apples are best for sauce, others for drying, and perhaps others for juice.

Yield of product is an important cost element. Sauce and juice manufacture yields a high ratio of product per ton of fruit. Seventy percent of the raw fruit can be put into bottles in juice form. Peeled and cut products have lower yields because mechanical and hand removal of peel and core is not as efficient as using pulpers and juice presses. Furthermore, cutting apples into slices and dice results in many pieces too small to be included in the product. If a sauce or juice line is not available to use these fines, they represent a loss.

Another factor determining product yield is the length of time apples have been in storage. At the beginning of the season, yields of processed product are the highest. As apples remain in storage and defects develop and become more apparent, yields diminish, especially for peeled and piece form products. For highest yields, processing should be done as rapidly as possible after harvest. Where processing apples become available only as they are sorted out of the fresh pack, not much can be done to hasten processing.

With mechanical harvest and bulk handling looming larger in the future, we can expect an even higher percentage of bruised apples to be brought to the packing house. These will, of course, be removed from the fresh pack and be diverted to processing. Juice and sauce processes can best use this type of raw material. More sorting and trimming will be necessary for the fruit to be used in piece form products.

So far, raw material requirements and costs have been discussed more as a function of end product than of the process used. However, raw product characteristics are important in many processes.

Dehydrating and concentrating remove water so the product is sold on a solids basis. Low solids in the fresh fruit result in a low yield of salable product. Moisture removal, in vacuum or in air, results in the removal of volatile flavor fractions; the resulting product has few of the highnotes of flavor. The higher and sharper the initial flavor, the more it is retained in the concentrated product. There is a correlation between solids content and flavor, so for concentrated products, high solids apples are favored for quality as well as yield.

Canned and frozen slices and juices are not sold on the basis of solids, so lower solids apples can be used to advantage. These apples, therefore, may result in satisfactory yields of product, but from the standpoint of quality may be lacking in some respects.

Unfortunately, the best apples for the fresh market are not always the best for processing. Because total returns are determined largely on fresh sales, growers tend to grow the varieties best for fresh. So we see a lot of Delicious apples produced. It is possible to chemically modify the products from such apples. For example, acid can be added to make the juice more tart and calcium salt to make the apple firm, but perhaps processors prefer not to have to put "acid added" or "salt added" on the label. Blending is possible for some products, but at added cost. For best quality and uniformity, blending is usually desirable.

Processing is doing in the factory the job of preparation previously done in the home. But home preparation results in all degrees of product output and variable quality. A bad home-baked apple pie may be tolerated by a loving husband. Perhaps any kind of apple can be used. But the same degree of tolerance is not permitted of factory-prepared products. So the processor's job becomes doubly difficult. His product must be uniformly good (not necessarily excellent, but never bad), and it must be able to withstand the processing, packaging, storing, and distribution necessary to get to the user. The manufacturer, like Caesar's wife, must be above reproach. He would like to use the best apples for a given product but may not even be able to get them. And if they are available, they may cost too much for his product. Hence the economics of raw material supply to the processor are a complex relationship involving compromise, perversity, inconsistency, frustration, and agonizing decision. The times that he is ever completely satisfied with all the factors experienced in a production run may be as scarce as hen's teeth.

But one thing is quite clear concerning the relation between raw material and process economics. There are many facets about raw material availability and quality and product requirements that make as big an impression on process costs as the basic differences among the processes themselves and the effects they have on processing costs. I refer here to the usual processes, not the so-called "space-age" ones.

Process costs.--The first factor affecting process costs is the one just discussed--raw material. A most obvious effect concerns the physical condition of the fresh apples. The amount of damaged or waste material which must be removed affects not only yield of product but also the costs of sorting, peeling, and trimming. For a juice product, this cost is least, next comes sauce, and then apples in piece form.

A juice line requires a minimum of labor, especially with the newer presses. Sorting is probably done by a few women on the line, before apples go to the chopper. In a sauce line, a half dozen or so trimmers may follow about 20 peelers; but for slices the number of trimmers may be double that. If the fruit is in bad physical condition, the number of trimmers is even greater. For sauce, trimming must remove colored peel and material that can affect sauce color. Red apples need a more complete trim than yellow ones and more trimmers on the line.

Coring and trimming for B grade slices require more material removal than for C grade; so for the B grade, yields are lower and trimming costs higher. Buyer requirements therefore are important in determining process costs. While I am trying to consider just process factors, it is obvious that these matters are also the function of product requirements.

Products that are blanched and/or water-conveyed experience leaching losses, and most processors do not seem to know how bad these losses really are. They may be concerned with evaporation losses in freezing but may transport the same product only by fluming. Losses in a process may or may not be serious depending upon the extent of the loss, the value of the product, and what it may cost to avoid the loss. A high-value product justifies a much greater effort to avoid loss than a low-value one, and a large loss justifies more effort than a small one. In figure 18 we see these relationships expressed. The figure refers to freezing losses, but any kind of loss is also represented.

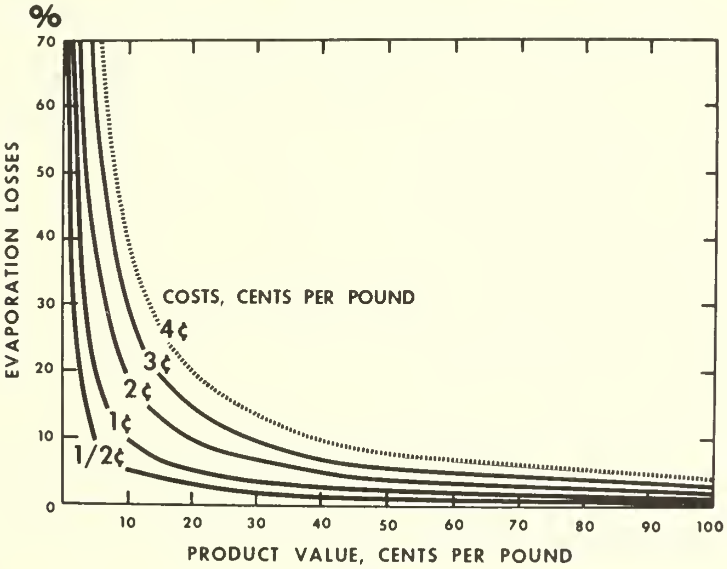


Figure 18.--Added costs that can be justified to eliminate processing losses.

Factory processing usually involves less preparation loss than preparation in an institution or at home. Furthermore, the processor is working with a much lower cost raw material than is the restaurant operator who buys the apples after they have gone through storage and distribution. Apple processors can get a maximum yield because they are engineered for that purpose. But such efficiency is not necessarily automatic.

Processors know that the matter of keeping knives sharp is important in process costs. A plant that assiduously keeps all the knives sharp (in the mechanical slicers and dicers, on the apple peelers, even in the hammer mill, and along the trimming line) will experience lower costs, higher yields, and better quality, but perhaps more cut fingers. There are many similar items of housekeeping and operation that influence costs in different ways and for different processes and products. Someone should write a book giving all these factors the attention they deserve.

In a study made some years ago, Kaufman (1951) found that among the conventional methods for preserving pie-stock apples (dry, canning, and freezing), the preservation processes themselves make only minor differences in total cost. Essentially the same operations of sorting, peeling, trimming, coring, and slicing are involved in all these processes and account for a large part of the processing costs. Drying-, canning-, and freezing-cost differences are minor. These data are summarized in table 1.

TABLE 1.--Costs of processing apples by conventional methods

	Cost per ton of raw apples				
	Processing	Packaging	Storing	Shipping	Total
Dried	$27	$ 3	$ 1	$ 5	$ 36
Canned	24	26	5	21	76
Frozen, no sugar	26	24	22	30	102
Maximum differences	3	23	21	25	66
Dehydrofrozen	31	12	11	15	69

The maximum difference among the three processes is only $3 per ton. More important for sliced apples are packaging, storing, and shipping costs. When these are added under the conditions Kaufman assumed in his study, differences become large and significant. These figures show that the following factors are more important than differences in processing costs: (1) bulk and weight to be packaged, stored, and shipped; (2) type and size of container needed; and (3) environment needed to preserve the product until it is used by the homemaker or pie baker.

Compared with fresh apples, all processed products have the advantage of elimination of waste material. Dried apples have the further advantage of least bulk and weight, minimum package requirements, and no need of special costly environment. Ordinary dried apples of over 24-percent moisture require no special packaging, but low moisture (under 5 percent) apples must have moisture-proof containers. Canned and frozen apples have similar package costs, but the need of 0°F. environment for the frozen raises its distribution costs above those for canned.

If we wish to lower the costs of pie-stock apples, where do we start? Not much can be done in process costs. Apples still must be sorted, peeled, trimmed, sliced, blanched or sulfited, and so on. Obviously, the things to go after are the package, bulk and weight, and environment.

Traditionally, few apples are frozen. While the quantity has grown at the fastest rate of any group of processed apples, frozen still represents less than 5 percent of all apples sold. With such a rapid growth rate, however, frozen apples could reach impressive proportions in not too many years.

At the Western Regional Research Laboratory, we feel dehydrofreezing offers a solid economic gain for frozen apples. In this process, half of the weight of apples is removed by dehydration with little change in quality. The product also has lost about half the bulk. Consequently, package, storage, and transportation costs can be halved. But there is an additional gain. Frozen apples have been packaged mostly in the 30-lb. enamel can. Dehydrofrozen apples do not need a metal container because even when thawed, there is no free moisture. The cost to package the equivalent of 30 lb. of apples (15 lb. as dehydrofrozen) becomes only a fraction of that for frozen. A plastic-lined carton does the job nicely. I have mentioned cost savings, but bakeries also find convenience and quality factors compelling reasons for using dehydrofrozen apples. So far, there has been no interest in retail distribution of this item. Oddly enough, we thought dehydrofreezing would be most advantageous in the Pacific Northwest. But dehydrofrozen apples are packed only in New York State for use mainly in the Middle-Atlantic metropolitan areas.

The limited use of freezing for apples so far suggests that perhaps frozen apples do not offer the great quality improvement over the canned product as is apparent for fruits such as oranges. There is an improvement, however, which must account for their rapid rate of growth. Frozen products, on the other hand, are less convenient to use than canned, and this may suggest why canned applesauce has no competition from frozen.

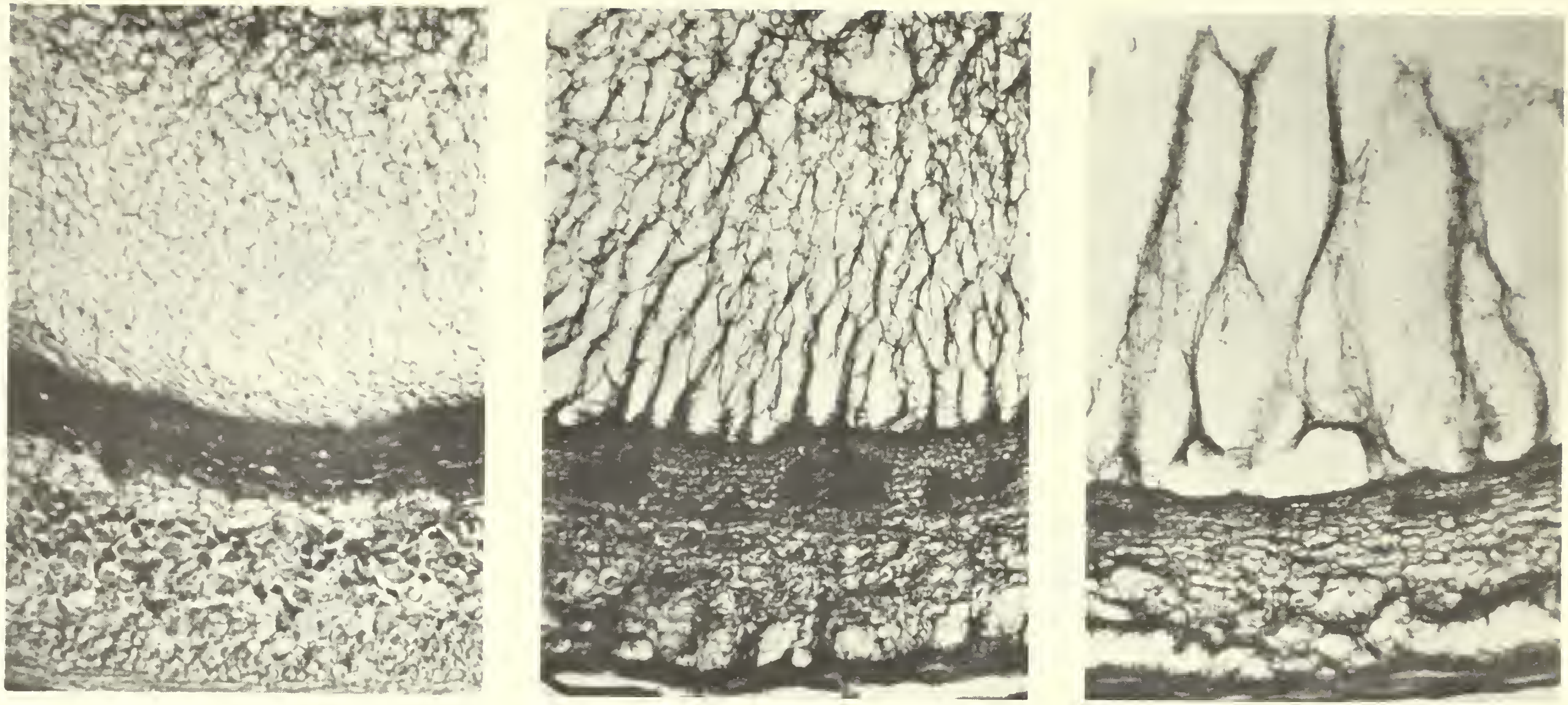
Well over half of the pack of canned applesauce is in retail sizes. This product finds a ready use by housewives who like its convenience. The sauce is ready to use the moment the can is opened. It may be served and even stored in the can. The demand response to price changes suggests that relatively low cost is another reason housewives like canned applesauce. One might speculate whether the excellent dehydrated applesauce now in commercial production would find ready acceptance by housewives if it were offered to them. The product fulfills all three requirements for low cost--low bulk and weight, low-cost package, and ordinary storage environment. The question to answer, however, is how housewives would view its convenience. If it is judged by them to be less convenient but lower in price than canned, which factor becomes more compelling?

In the institutional and remanufacturing markets, the dehydrated sauce should have a clear edge. It should be lower in cost; it can be reconstituted to any desired consistency for each intended use; and it can readily be incorporated into dry-mix products, thus giving apples a new market. The volumes used in large-scale feeding and remanufacturing should help compensate for any loss of convenience, especially when the total cost of use should be less than with canned sauce. Obviously, we need both products--canned and dehydrated.

Frozen apple juice concentrate should have a cost advantage over canned juice, even in the retail market. Several reasons can be given why this fine frozen product hasn't had the great growth that frozen orange juice concentrate has: (1) Apple concentrate is relatively new and hasn't been introduced in all markets; (2) the product it tends to compete with, canned juice, has good market acceptance--quite unlike the acceptance of canned orange juice; (3) frozen concentrate is somewhat less convenient to use than canned juice; (4) lacking an overwhelming quality advantage, the concentrate must compete also on convenience and cost aspects. On the basis of market tests and sales to date, we don't really know how the housewife rates these features. The institutional user, however, will tend to favor the cost advantages of the frozen concentrate. Obviously, factors not part of process costs keep showing their importance in process economics--namely, convenience and quality. These factors are a part of the overall economics, because they help determine what a buyer will choose and pay for.

For any process or product present day economics dictate that the process be done at the lowest cost that will produce a quality or degree of convenience the buyer is willing to pay for. Too often, buyers are not willing to pay for as good a quality as processors are able to deliver. For example, let us consider frozen strawberries. We know the quicker the freeze, the better the quality, especially in texture. But a buyer may settle for "case-freezing" in packages to save a few cents. Even in freeze-drying, a high-cost process to produce a superior quality dehydrated product, one can fudge a bit to shorten drying time by permitting the temperature of the product to get above the freezing point too soon. Cost is partially a function of drying time, so a reduction of time is directly translatable into cost savings, but at a sacrifice of quality.

In a market where price may be an excessively dominant factor, little encouragement may exist to improve the product.



instantly **quickly** **slowly**

Figure 19.--Effect of freezing rates on green bean structure.

About all the processor can reasonably do is to produce the best product the consumer is willing to pay for.

New processes.--So far, I have talked about the ordinary processes, and I hope it is evident that other factors are usually more important in product costs than basic differences among these processes. In this space age, many are expecting that new methods, seemingly related to that age, may significantly change food processing in the future. I shall discuss briefly two processes that have achieved a commercial foothold--freeze-drying and liquid nitrogen freezing. Both offer a considerable quality advantage over conventional processes for many commodities. One must first determine how much advantage is possible for his particular situation. Freeze-drying offers a most satisfactory way of drying meat, but it won't help the raisin producer. Liquid nitrogen (LN) freezing can significantly improve quality of many foods, but for other foods the quality differences are much less. Figure 19 shows the effects of freezing green beans at three different rates. The liquid nitrogen frozen bean is obviously superior to the other two. A new freezing processing using Freon 12 gives a quality close to that possible with LN.

Among the usual freezing methods, costs are quite close. Figure 20 compares plate, conveyor, and fluidized bed freezing. To choose a method among these, one would have to look at other factors as the differences shown are too small to be conclusive.

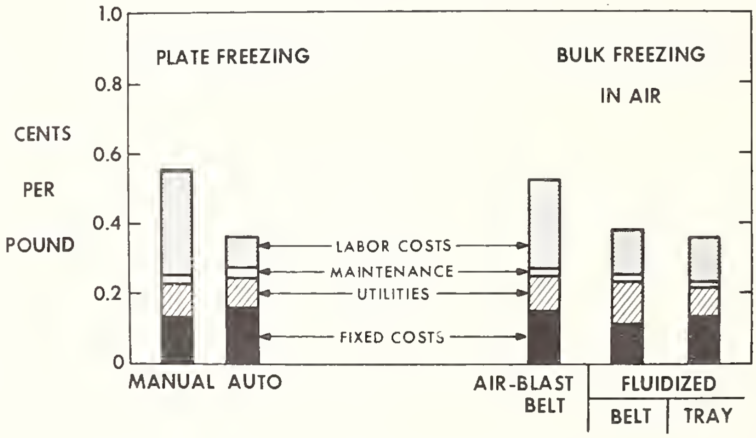


Figure 20.--Costs of freezing vegetables by conventional methods.

But now look at cryogenic freezing. Figure 21 shows the cost of freezing strawberries. An important factor is the price of LN which has been decreasing recently. Here it is assumed that LN costs 3 cents a pound and that 1.5 lb. of LN is needed per pound of strawberries. The difference in freezing cost is now very significant. Unless other factors can justify the cost of LN

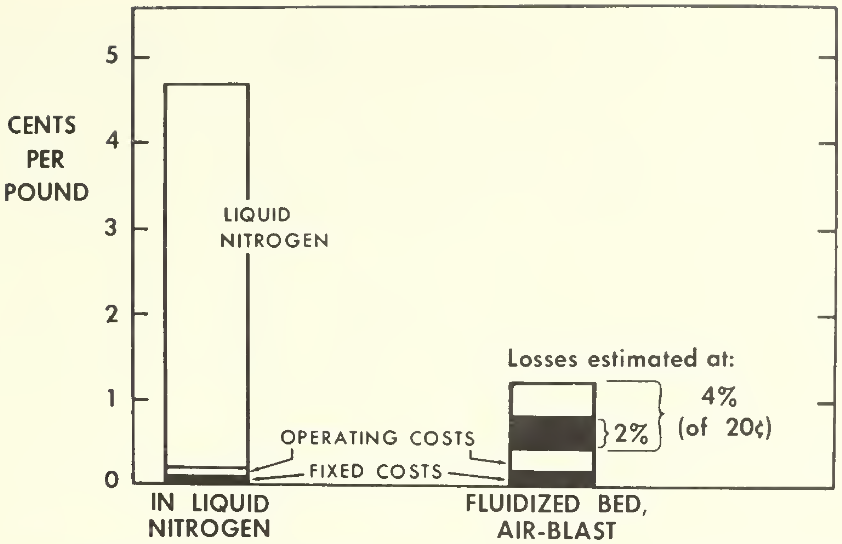


Figure 21.--Costs of freezing strawberries (IQF) in air-blast and in liquid nitrogen.

freezing, it will not be used. The Freon 12 process may give a freezing cost about 1/2 cent above conventional processes and significantly below that of LN.

Freeze-drying, likewise, is much more costly than conventional dehydration. For meat worth a dollar or more a pound, a high cost may be justified, especially if no other method can do the job. But who needs freeze-dried products? There are some obvious needs, but we can feel certain that the bulk of our food does not now and never will need to be freeze-dried. Cost estimates vary for freeze-drying, generally between 5 cents and 15 cents per pound of water removed. These compare with costs around 1 cent a pound or less for usual drying processes.

Let us assume that LN freezing costs 3 cents a pound and freeze-drying a low 5 cents a pound of prepared apple slices. Allowing for preparation losses, the costs would be about $90 a ton of fresh apples for LN freezing and $150 a ton for freeze-drying. We see from table 1 such processing costs are now very significant indeed and are more than total processing costs including all preparation. The next questions are, does the buyer need the quality these processes offer and will he pay the additional cost. If there are enough who will, you have an economic process.

Summary.--I have attempted to review the economic factors in apple processing that may give us an insight into how another million tons of apples a year can be processed and marketed successfully. The past successes and growth of canned applesauce and juice products can be expected to continue, but other items must find increased usage to take up the slack of expanded production. Demand elasticity data indicate that lower prices on processed apples help expand demand significantly. Thus, the greatest opportunity for large volume processing will be in products that continue to offer cost savings and those that will result in a further shift from home to factory preparation, providing lower, cost with convenience. Significant cost savings can be made in products that have: (1) high yields; (2) low-value raw material; (3) adaptability to factory methods of peeling, coring and waste disposal; (4) minimum bulk and weight through concentration; (5) low-cost packaging requirements; (6) no special storage and shipping environments; (7) low-cost processing. While specialty product markets will pay the prices necessary for certain quality products, they will not bulk large in the total utilization picture.

For the consumer, a low price for a given product is important, but low price alone is not enough, especially for the housewife. The product must have a certain degree of quality and convenience so that she can use it with confidence without undue effort. In institutional use and in remanufacturing, convenience will doubtlessly play second fiddle to cost savings if quality is equal.

Perhaps we should take heed of increasing recognition that Americans consume too many calories and consider how apple products can help to remedy the situation. I suppose most apple slices end up in pies and other bakery goods. A 4-in. piece of apple pie weighing 5 oz. contains 330 calories. A similar quantity of apple has about 125 calories, just over one-third. Not only does the pie represent more calories, but the apple portion is only a minor part of the 5 oz. Does this suggest that in a market, as we try to sell more apples, we should not also be selling more flour, starch, sugar, and fats, all higher in calories than apples? In contrast, as much as two-thirds of our orange crop goes to market as a juice and is consumed without the benefit of whipped cream, sauces, butter, and starches. For a good dessert, perhaps we should follow the Italian tradition of a bowl of fruit, consisting mostly of just good fresh apples.

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EXPLOSION-PUFFED APPLE SNACKS AND OTHER NEW APPLE PRODUCTS

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Today I shall tell you about the important developments in explosion puffed apples that have taken place since 1966 when Mr. Eisenhardt of this Laboratory discussed explosive puffing at the First Apple Utilization Conference. These developments are: (1) the early results of an institutional evaluation by an interested eastern company which are quite favorable; (2) the improvements we made in explosion-puffed apple snacks to make them competitive with the other snack items. Before I discuss these two developments I shall review explosion puffing and its applicability to apples. Then I shall briefly discuss the results of the market test, the problems connected with the explosion-puffed apple snacks, how we solved them, and the prospects of these new items.

The explosion-puffing process is a method developed at our Laboratory for producing rapidly rehydratable fruit and vegetable pieces. In this process the fruit and vegetable pieces are first partially dried by conventional hot air drying. Then they are rapidly heated by superheated steam under pressure in a specially designed gun. This raises the water in the pieces above its atmospheric boiling point. The pressure is then instantly released, the water in the pieces is vaporized, and the escaping vapor produces a porous structure. This porous structure now permits rapid final drying and rapid rehydration of the dried pieces. The dried product now has a highly desirable crisp texture which in the case of the apples and celery makes them snack items suitable for out-of-hand eating.

This brings up a question that has been asked frequently: Is this process the same as the cereal puffing process? First, let us compare the products from the processes. Explosive puffing produces a product which, when reconstituted, closely approximates the original fresh fruit or vegetable pieces in size, shape, color, and flavor. Cereal puffing produces new grain products; the pieces are 6 to 10 times the original and they are different in shape, color, and flavor from the original grain.

Processing conditions as well as equipment are quite different. The moisture content of the fruit and vegetable pieces used in explosion puffing ranges from 12 to 30 percent while that used in cereal puffing is 10 percent or lower. The discharge pressures used in explosive puffing are much lower than those used in cereal puffing. The highest pressure used in explosive puffing is around 70 p.s.i.g. while those used in cereal puffing range from 200 to 300 p.s.i.g. Finally, the cereal guns are much heavier and have a smaller capacity. So it is apparent that the only similarity between the two processes lies in the instantaneous pressure release.

How do explosion-puffed fruit and vegetable pieces compare with those that have been conventionally air dried only? Explosion-puffed pieces dry rapidly; the pieces are large and possess a porous structure because of which, the products are ready to eat after 2-6 min. simmering. The explosion-puffed pieces have a crisp texture which makes them suitable for use as a snack item. Conventionally dried pieces are small, shrunken, and hard and the products require a long soaking period or 30-40 min. boiling to prepare them.

Now that we are familiar with the general principles of explosive puffing let us consider the application of this method to apples. First, the apples are peeled, cored, sliced, and sulfited. The pieces are then partially dried to 12-18 percent moisture in a conventional hot air dryer at 180°F. dry bulb and 100°-110°F. wet bulb. The pieces are then equilibrated for 16 hr. to ensure uniformity of moisture content throughout the batch. After equilibration they are puffed, that is, they are held for 1 min. in superheated steam and then the pressure is released instantaneously; the steam pressure used is 20-25 p.s.i.g. and the steam temperature is 330°F. (about 60°F. superheat). Puffing is followed by final drying to a moisture content below 2.5 percent.

What are some of the possible uses of dehydrated explosion-puffed apples? The suggested uses are: pie filling, baked apple compote, snacks, fruit topping on dry cereals, and instant applesauce to be used as an ingredient in baked goods, candy, or as is. The instant applesauce powder is prepared by grinding explosion-puffed, dehydrated apple pieces unsuitable for snacks or pies because of shape or size.

As I told you at the beginning, the slices and the powder are being evaluated by an eastern manufacturer and the results of this test have been encouraging. The evaluation reveals: (1) the applesauce powder is good and is satisfactory as an ingredient in candy; (2) the applesauce powder is better than a commercially available applesauce in an applesauce cake; (3) slices and applesauce powder were tested in several large cafeterias, one of which serves 2,500 employees daily. The products were served as is, in compote, and in baked goods. The products were as good as the apple products regularly served; there were no complaints. These results can be summed up by quoting directly from the company's private report: "After reviewing the reasons for this test I think we have found the quality of these products in the present form to be acceptable."

Now, let us turn our attention to the snacks; the rest of this discussion will be devoted to them. Explosion-puffed apple snacks have a serious disadvantage--their extreme hygroscopicity, that is, they readily pick up moisture when exposed to hot humid conditions, rapidly losing their crispness and hence their acceptability as an out-of-hand snack item. We found that a moisture content around 4 percent could be considered critical, and to maintain crispness the moisture content should not exceed this value. At around 4.3 percent, the pieces become very tough and leathery and above 6.0 percent, tough and rubbery. Then as more moisture is adsorbed they finally become soft and spongy. When we exposed pieces with an initial moisture content of 2 percent to an atmosphere of 75 percent relative humidity at 90°F., we observed that this critical value 4 percent was exceeded in around 40 min., and the pieces were no longer crisp. At 72°F. and 75 percent relative humidity, the pieces lasted an hour; about 15 min. later they lost their crispness, having reached a moisture content of around 4.3 percent.

Our objective was to find some way of keeping the porous structure obtained by explosive puffing and at the same time significantly improve the resistance to loss of crispness. First of all, let us consider what is probably the major cause of this loss of crispness. The breakdown of the glassy or amorphous sugars in the apple piece is responsible for the loss in texture. High temperatures, high humidities, or both break down the sugar glasses into sugar solutions. What this does to crispness is obvious.

You may better understand the mechanism of this breakdown after I discuss the following important points: (1) The differences in hygroscopicity of the amorphous forms of the three major sugar constituents of the York Imperial apples used in our experiments; (2) the softening points of these sugars; (3) the difference in hygroscopicity between the crystalline and amorphous forms; (4) the effect of moisture on the softening points; (5) the relative amounts of the sugars.

The three major sugar constituents are glucose, fructose, and sucrose. If we examine the equilibrium moisture data of their amorphous forms which are available in the literature, we see that above 15 percent R.H. fructose and sucrose readily adsorb moisture, while for glucose 60 percent R.H. is the point above which it begins to adsorb moisture. While it might appear that glucose would offer the best protection since it is the least hygroscopic of the three, it is not so because another physical property must be considered--the low softening temperature of amorphous glucose and the even lower softening points of supercooled glucose solutions.

However, before I discuss the softening temperature I should like to point out the difference in hygroscopicity between the crystalline and amorphous forms of the sugars. You will then understand why so much attention is being given to the amorphous form of the constituent sugars. Crystalline glucose and sucrose are practically anhydrous below 80 percent R.H., which is the critical value; above this they begin to adsorb moisture. Crystalline fructose only begins adsorb moisture above 55 percent R.H., making it less hygroscopic than its corresponding amorphous form. Because of the difference in hygroscopicity between the two forms it is quite reasonable to conclude that the sugars are present in the amorphous form (if the sugars were present in the crystalline form they would pick up less moisture and maintain their crispness longer).

Let us now consider the softening temperatures. The softening temperature is highest for sucrose as would be expected since its molecular weight is higher than that of glucose and fructose. While no value for fructose could be found in the literature, we can infer from some basic principles that it would be equal to or less than that of glucose; it has the same molecular weight as glucose and its crystalline melting point is less than that of glucose.

In addition, one more point is of great importance--the effect of moisture on the softening temperature. It has been reported that for each additional 1 percent moisture, the softening point for glucose is lowered 8°C. (14°F.). Amorphous fructose containing 1 percent moisture has been reported to be plastic at 25°C.

Based on the foregoing ideas, since glucose and fructose account for 80 percent of the sugars in apples used in our puffing process, we can implicate them as being chiefly responsible for the rapid loss in texture. Now, if we could replace most of the monosaccharides, that is fructose and glucose, with sucrose, a sugar having a higher softening temperature, we should improve the resistance to loss of crispness.

We successfully carried out this interchange of sugars by a simple two-step procedure in which we first leached out practically all of the monosaccharides and then replaced these sugars with sucrose by soaking the pieces in sucrose solutions. We carried out this two-step treatment after the sulfiting step and before processing by explosive puffing.

Let us look at the leaching step: Apple segments were soaked in tap water at 70°-80°F. for 4-6 1/2 hr.; by this method we removed as much as 80 percent of the sugars. However, to effectively leach out the sugars the pieces must be soft. Sulfiting the pieces softens them and significantly increases the rate of sugar efflux; without sulfiting only around 25 percent of the sugars could be leached out. We did not try any other methods of softening the pieces prior to leaching. During leaching the pieces picked up water and lost some solids other than sugars.

After leaching out the monosaccharides the pieces were then soaked in solutions containing 20-40 percent sucrose. Water flowed out of the pieces because of the difference in osmotic pressure, and sucrose diffused into the pieces because of the difference in sucrose concentration. The magnitude of each change was in proportion to the concentration of the solution used. With the 40 percent solution enough sucrose was added to overcome the amount of solids lost during leaching. However, using 20 percent solutions still left us with a weight loss.

All the leachings and the soaks in sucrose solutions were carried out using the same ratio of apple pieces to liquid: 1 part by weight of slices to 2 parts by weight of liquid.

Up to now I have made no mention of either acid loss or addition. During leaching, acid diffuses out. We replaced this acid by adding acid to the sucrose solutions used for soaking. We also added volatile flavor constituents by adding apple essence to the soaking solution. However, when we added acid back in this manner, inversion of sucrose took place in storage and these pieces showed no improvement in retention of crispness under humid conditions.

Since the pieces without acid were too bland even with flavor added, some method of adding acid without inverting the sucrose had to be found. We did this by tumbling with acid prior to puffing. Enough acid was picked up to give the pieces a tart flavor. Fumaric acid replaced the sodium silico aluminate which is used to prevent sticking during the puffing step. After the pieces are modified, the treatment to prevent sticking is unnecessary. Tumbling 1/2 hr. with 1.8 to 2.4 percent fumaric acid (based on dry weight) gives the maximum amount of acid that the pieces are capable of picking up. These pieces showed practically no evidence of inversion, and they maintained their crispness for 2 hr. at 75 percent R.H. and 90°F.

At the start of this presentation I pointed out that by the time the untreated pieces reached 4.3 percent they had lost their crispness. For the treated pieces this critical value is around 6.8 percent. The untreated pieces take about 40 min. to reach 4.3 percent at 75 percent R.H. and 90°F. At 72°F. and 75 percent R.H. they take about 1-1/4 hr. to reach this value. On the other hand, the treated pieces can tolerate more moisture, and to reach 6.6 percent, where they are still crisp, it takes 2 hr. at 90°F. and 75 percent R.H. At 72°F. the pieces take 5 hr. to reach 6.6 percent and they are still crisp. In about 15 or 20 min. more they reach 6.8 percent and are no longer crisp.

How do these treated snacks compare with snack items currently available on the market? We tested them against potato chips, corn chips, and pretzels at 90°F. and 75 percent R.H. The corn chips were inferior to the apple snacks, since they lost their crispness in 2 hr. while the snacks were still crisp. The chips and sticks were still crisp after 3 hr. while the snacks had become tough and chewy. However, the pieces (because of the treatment) can be considered as being in the same league as the other snack items currently available. Without the treatment, apple snacks could not compare with the corn chips.

Laboratory research can only bring us up to this point. The rest, that is, consumer acceptance of the item, is beyond the scope of this talk. However, the snacks are now being evaluated. We are running a cooperative test with Michigan State. The test is preliminary in nature; its purpose is to get an idea of what consumer reaction would be to this sort of item. If this test proves encouraging, we will have a consumer test plus a cost analysis of the explosive puffing of apples that should then give the complete picture on explosion-puffed apple products.

THE ADVANTAGES OF INTEGRATED ORGANIZATIONS IN PROCESSING AND MARKETING OF FRESH AND PROCESSED APPLE PRODUCTS

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(Former General Manager, Diamond Fruit Growers, Inc.)
Hood River, Oreg.

The present Northwest apple marketing system is the result of many years of evolution. When the original growers found that they could produce some of the best quality apples in the world on Northwest soils with glacier water and western sunshine, they devoted all of their attention on how to grow superior apples, and then they developed an elaborate system on when and where to sell them in the fresh form to best advantage. The premier position that Northwest apples have won in the world proved that they were right.

The marketers of Northwest apples have carried to the ultimate the marketing science of scheduling and controlling the rate of sale over time. Before European and other protectionist countries set up artificial barriers, Northwest apples had distribution as to place which was superior to Coca Cola. I was reminded of this several years ago when I came upon a carton of Diamond brand apples in a Chinese arcade near Sha Tin up toward the Chinese border. The option of place has been given adequate attention.

Only recently has the option of form been accorded respectability in the marketing of Northwest apples. Increasing production and the downward trend in the per capita consumption of fresh apples are factors that the apple industry cannot ignore. This afternoon we are considering effective utilization of Northwest apples. We have come a long way. Effective utilization can have several meanings. It might mean complete utilization in the sense that all of the crop would be utilized without waste. Effective utilization might also refer to the attribute of flexibility which permits shifting emphasis from fresh to processed as sales opportunities arise. Or effective utilization might mean that utilization in which marginal net returns from fresh and processed are equal. In my discussion of the role of organization in effective utilization I will have occasion to use the term "effective" in all three meanings.

There is a distinct difference in meaning between the terms "divert" and "allocate." In order to understand this distinction as applied to apple utilization, I will compare the use of the alternative marketing systems in Washington State with practices followed in other producing areas with canning facilities. In most of the important apple producing areas except New England and the Pacific Northwest, the grower or his representative decides whether he will sell his crop to the processor or have it packed for the fresh market. In the 6 States of New York, Pennsylvania, Virginia, West Virginia, Michigan, and California, which supplied about 80 percent of the processing apples in the United States during the last 9 years, 58 percent of commercial production has been utilized in processing. About 87 percent of the apples destined for the processor were delivered in orchard run form. The other 13 percent were "table sorts" and were diverted from the packing houses.

Contrast these marketing practices with those followed in the States of Oregon and Washington where processing apples accounted for only 20 percent of commercial production during the last 9 years. In Oregon and Washington, practically all apple crops are delivered direct to the packing houses or to storage for subsequent packing. Typically, the apples sent to the processor consist of packing-house culls, C Grade red varieties, an occasional crop of low quality orchard run apples, and a small but fluctuating percentage of low value grades and sizes of packable apples.

The fundamental difference in approach to utilization is this. In most apple producing areas except New England and the Northwest, the grower determines whether his crop of a particular variety will go to the processor or be packed fresh. In the Northwest, the growers have indicated by the varieties planted and the elaborate marketing machinery provided, that they intend their apples to be sold fresh unless there is a good reason to the contrary. For the reasons described, I think that it is within the accepted definition of the word "system" to say that the Northwest has one apple marketing system with a "fresh" component which is dominant and a processing component which is dependent. The term divert is more appropriate than the word allocate.

In the fresh sector of the Northwest apple marketing system, there are about 185 firms that perform two or more of the functions of packing, storing, and shipping of apples. Two of these concerns are vertically integrated cooperatives, which in addition to apple packing, storing, and shipping, include canneries and fruit product sales departments. The above number also includes 27 local cooperatives that pack and store members' fruit. There are 13 concerns in the Northwest that process apples. Three of them are located west of the mountains. Of the 10 that are located in producing areas, 2 are represented by the cannery department in the vertically integrated co-ops mentioned above. In addition there is one apple processing cooperative.

There are two categories of apples that are diverted to processing. (1) Culls and C Grade red varieties, that are governed by State grading rules (and in Washington the C Grade Law). (2) Packable apples that are diverted in accordance with the decision of an executive, a committee or a board of directors in the fresh packing concern, or by the grower if he operates his own packing house. These individuals play a very important role in determining if any packable apples are to be diverted to the processor.

Accounting theory and practice have a direct influence on decisions relating to utilization. It is inherent in the Northwest apple marketing system that all apples received and sorted at the packing house will be assessed a charge. In most cases this charge sometimes called overhead includes most of the costs incurred in the packing and storage operations except packing labor and materials. This means that when any packable apples are diverted to processing, the remainder of the pack is expected to absorb the packed box charge of the packable apples. This constitutes a real hurdle.

Almost every year Washington State apple growers and shippers encounter different supply-market situations which call for utilization decisions. Figure 1, which covers Washington State production-utilization history from 1959-68, illustrates some of these situations and how growers and shippers reacted to them. Line A, which represents Washington State apple receipts, is expressed in terms of pounds per capita. This figure ranged from a low of 4.42 lb. per capita in 1961 to 8.3 lb. in 1966. Line B represents the percentage relationship between returns for processing apples and fresh apples. The higher the percent the greater the incentive to divert low value grades and sizes to the processor. There are other factors such as quality of crop that influence the rate of diversion to processing, but they cannot be expressed graphically. Line C represents the percent of each crop(1959 to 1968) that was diverted to processing.

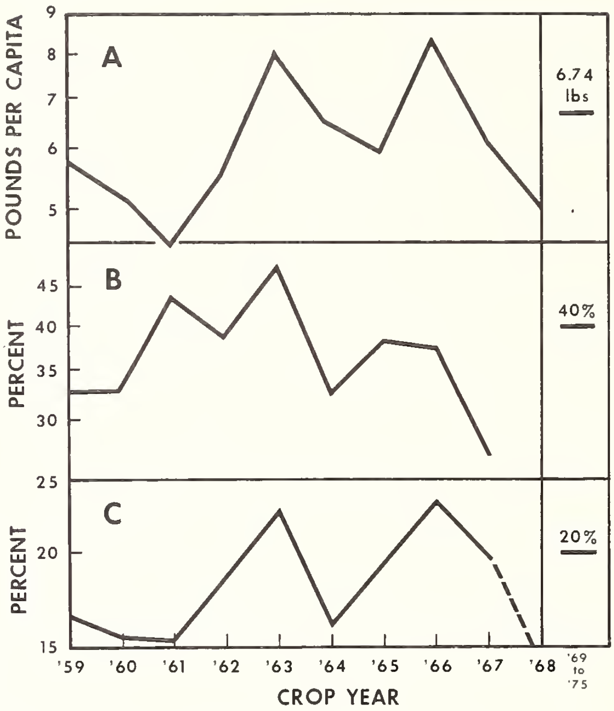

Figure 1.--Washington State apple production-utilization, 1959-1968:' A, Packing-house receipts; B, processing returns as a percentage of fresh; C, percent of receipts processed.

In 1959, '60 and '61, before the C Grade law was enacted, diversion to processing averaged 15.8 percent of apple receipts; during 1962, '64, '65 and '67, when apples sold averaged 6.03 lb. per capita, diversion to processing averaged 18.5 percent. In 1963 and 1966 when apple receipts averaged 8.62 lb. per capita, diversion to processing was 22.9 percent of production. In 1968 when apple receipts averaged 5.04 lb. per capita, diversion to processing was 13.9 percent.

I have projected (not forecast) apple receipts for Central Washington at an average yield of 13.3 tons per Equivalent Full Bearing Acre for the period 1969-75. This would reflect receipts ranging from 31 million 42-lb. bushels in 1969 to about 36 million bushels in 1975. These average receipts would be equivalent to 6.74 lb. per capita. Diversion to processing channels should average about 20 percent during the period 1969-75. No attempt has been made to estimate the extent to which freeze damage to trees may increase the cullage rate. At the right-hand edge of figure 1 are three horizontal lines which project receipts, the ratio of processing prices, and the percent of receipts diverted to processing. Under the projected production just described, we can visualize the different kinds of situations requiring utilization decisions:

1. Some growers and shippers are concerned that unfavorable weather, as well as a severe shortage of harvest labor, might result in part of the crop becoming too mature for the fresh market. In this kind of situation growers might consider delivering the overmature part of their crop direct to the canneries. Any attempt to estimate how much tonnage might be involved would be pure speculation. Sufficient to say, apple processing plants would soon be swamped because their capacity is geared to the average rate of cullage accumulation from the present packing houses. Commercial processors cannot afford to create standby capacity unless they get more tonnage during short crop years.

2. If Washington State apple production continues to fluctuate as it has in the past, there will be several years when yields will exceed 16 tons per Equivalent Full Bearing Acre, as happened in 1963 and 1966. At this yield, apple receipts could reach 40 million bushels. Following the patterns of the past, shippers have usually high-graded or diverted more packable grades and sizes to the cannery. So it would be reasonable to expect diversion to reach 23 to 25 percent of packing-house receipts, or over 200,000 tons.

3. During years of short or average production, the rate of diversion to processing has usually dropped off sharply. There is some evidence that this trend may be changing. Export demand is slowing down, and the domestic trade is becoming more discriminating. There will likely be more of the low value grades and sizes that the salesmen will have to get rid of. At least that is how they describe their efforts to sell these slow-movers. Situations like this occur almost every year. For example, during the current season, which has been described as high priced, a number of shippers have been heard to say, "I should have sent my C Grade Goldens to the cannery." This kind of situation does not require across-the-board diversion as was the case with the C Grade red varieties. The so-called C Grade law passed by the Washington State Legislature in 1961 prohibits the sale of C Grade varieties in the fresh market. It is reasonably effective but inflexible. To accomplish selective diversion will require a different approach.

Traditionally, market prices have been relied upon to signal the shipper when and how much he should divert to processing channels. Sometimes market prices do not communicate clearly or in time to prevent the market from being cluttered up with low value packable grades and sizes, which had they been diverted to the cannery, would have provided better total net returns.

Market prices need to be supplemented with other guides. Price analyses provide such guides. In preparing for this talk, I asked Dr. Wallace Rehberg of Washington State University Department of Agriculture to advise me what would have been the effect on Golden Delicious f.o.b. prices in 1967 had the C Grade Golden, which comprised 10 percent of the pack, been diverted to the cannery. His reply reads in part as follows: "If 10 percent of all Golden Delicious in Washington had been withheld from the market in 1967, I would have expected the average f.o.b. price in Washington to have been:

Golden Delicious up $ .12 (per carton)
Red Delicious up $ .06 (per carton)
Standard Delicious up $ .06 (per carton)
Winesaps up $ .01 (per carton)"

Dr. Rehberg's letter came too late to determine if the price increase that would have followed the diversion of C Grade Goldens to the processors in 1967 would have been sufficient to overcome the increase in the packed box charge caused by the diversion. Price studies such as the one cited above should become a regular marketing tool to guide diversion decisions during average crop years.

Effective utilization requires a close-working relationship between the fresh and processing sector. The processor cannot satisfactorily develop new products and markets to take care of increased production when his supply is a fluctuating percentage of a fluctuating supply of apples. In order to satisfy his customer, a processor needs a more consistent supply of processing apples than has recently been the case. With no financial interest in the processing business, the average apple shipper isn't likely to respond.

Recognition of the need for more effective utilization usually originates with the grower. Late in the 20's the members of Diamond Fruit became concerned about a home for their expanding Bartlett production and wanted to improve their Bartlett returns, so they added a cannery department to their fresh fruit services. Some years later, the Hort Union (now merged in Snokist) added a cannery department, likewise to take care of increasing Bartlett production and improve returns. In both cases, cannery lines were soon added for apples and other fruits, and fruit products sales departments were provided to assure effective prices. Each cooperative is now fully integrated.

The vertically integrated co-op, like Diamond and Snokist, has many advantages in achieving utilization of apples: (1) The grower members have effective utilization as a goal, otherwise they would not have established a processing department in the first place. (2) These co-ops have continuing contracts with members, which assures supply and financial resources to provide facilities and underwrite product and market development. (3) Central management for all stages of packing, processing, and marketing provides coordination. (4) Facilities planned for integrated operations can be more closely tailored to requirements than where ownership of fresh and processing operations is separate. (5) Flexibility acquired through favorable access to both the fresh and processing outlets permits the vertically integrated co-op to exploit favorable market situations and capture the benefits for their members. (6) Diversion of packable apples from the fresh to the processing department of the vertically integrated co-op does not cause the same loss of overhead since there is a compensating increase of tonnage in the cannery department. General overhead which is common to both departments is not affected by diversions from fresh to processing.

Tree Top represents a different type of cooperative. It was established as a proprietary concern in 1947 to process single strength apple juice. It soon gained a reputation for quality and started advertising in Pacific Coast markets under the Tree Top brand. In a few years it became difficult to secure enough apples at current market prices to supply the demand for Tree Top juice. Following the Welch example, Mr. Charbonneau, the owner, sold Tree Top to a cooperative formed to acquire his company. Tree Top has continuing contracts with over 2,200 growers for a specified percent of their culls and C Grade apples. These members may be independents or members of local cooperatives. Arrangements are maintained with the packers who handle the members' apples to set aside the apples contracted to Tree Top.

Tree Top advertising was increased, and the pack of single strength juice expanded as supplies became available under the cooperative arrangement. Anticipating larger apple crops, Mr. Charbonneau--who continued as manager--introduced frozen concentrated apple juice in 1963. The introduction of the frozen concentrate enabled Tree Top to develop markets that were not available to single strength juice because of freight costs. Markets were opened up east of the Rockies, and distribution of the frozen concentrate now extends to Chicago and south to the Carolinas. Both types of juice are advertised west of the Rockies with no apparent conflict.

Last year, in order to broaden the product line and provide an outlet for the members' peeler type apples, Tree Top acquired Chelan Packing Corporation, an apple dehydrating concern located in Wenatchee. Shortage of processing apples is handicapping all Tree Top operations this year. Since the shippers who pack the apples of the Tree Top members are not themselves members of Tree Top, there is not the same degree of coordination between fresh marketing and processing as exists between departments in Diamond and Snokist. The influence of Tree Top on the shippers comes indirectly through the members because of better returns and service.

Figure 2 illustrates some of Tree Top's problems and accomplishments. The vertical bars represent tons of apples processed and show how tonnage has fluctuated due to fluctuating production and rate of diversion. Line A illustrates how Tree Top has used the heavy pack in peak production years to supply customers in short crop years. Flexibility as to rate of production of the different products and rate of sale is an important advantage which in the last analysis rests on continuing contracts with members. Line B represents the returns per ton to members. Except for one year, Tree Top returns have increased faster than returns for fresh and processing apples.

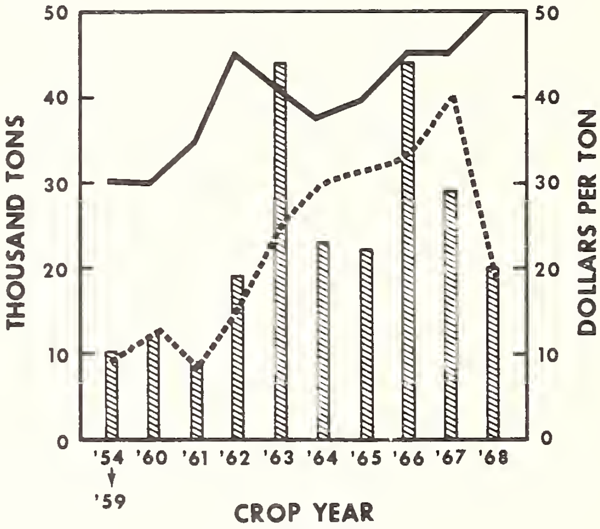

Figure 2.--Apple processing by Tree Top, 1954-1968
(Pack ▨, Sales ---, Returns ——).

Conclusion.--The primary marketing goal is to maximize total net returns through effective utilization of apples in the fresh and processed form.

Fresh apple utilization is still by far the most important form of utilization both in quantities of apples and in dollar sales value. Therefore, total dollar sales value of the portion of the crop utilized in the fresh form should be first considered in any attempt to maximize the total dollar sales value of the whole crop. However, almost every year there are opportunities through effective utilization to improve overall returns. Price analyses can provide a guide in appraising these opportunities. The packed box charge is one of the most serious hurdles to be overcome in order to facilitate access to the processing outlet and develop effective utilization. Improved returns for processing apples is one of the surest ways to minimize this hurdle. The vertically integrated cooperative provides a form of organization well adapted to accomplish effective utilization because it was created for that purpose. It can best minimize the hurdle of the packed box overhead by improving returns through internal efficiencies and market price enhancement.

A processing cooperative like Tree Top can provide improved returns through processing efficiencies and product and market development. This type of cooperative cannot easily be coordinated with packing and shipping. Further integration should be the goal of apple shippers and processors. To obtain this goal will require understanding of trends by the fresh apple sectors of the industry. In pointing out the advantages of cooperative processors and especially the vertically integrated cooperatives, I have no desire to disparage the efficiency and capability of the commercial processors who were the pioneers in apple processing in this area.

ORGANIZATIONAL PATTERNS IN OTHER COMMODITIES--THE FLORIDA CITRUS MARKETING STRUCTURE AND INDUSTRY INTEGRATION

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Certainly there are some differences between citrus and apple marketing, both fresh and processed. However, I see many similarities. Fresh citrus, while a substantial industry of 60,000 to 70,000 cars, only represents a little less than 20 percent of the crop. Yours would be much higher. We are concentrated in an area 200 miles long and 150 miles wide, while your production is spread throughout the country.

However, certainly our marketing problems are similar: (1) Not enough families buying; (2) high gross retail margins--at least on fresh; (3) need for new products, new packaging, and better quality standards; (4) too many sales representatives approaching a limited buying group due to mergers and supermarket growth; (5) need for more automation to reduce harvesting and handling costs.

When you spend most of your time involved in marketing problems and being caught up in the excitement of marketing perishables, the subject of marketing structure on the surface sounds about as interesting as practicing law in an insane asylum. However, looking at the Florida marketing system, we have either one of the most sophisticated and complicated, or the most ridiculous set of marketing organizational patterns of any agricultural area, but we do have plenty of organizations.

They are as follows: (1) Florida Citrus Commission for commodity advertising and promotion--currently spending 12.5 million dollars; (2) Florida Citrus Mutual, a growers' information service (90 percent of growers); (3) Florida Canners Association, tabulation of cannery statistics and advisory board on quality and other cannery matters (all canners); (4) Florida Fresh Fruit Shippers Association, advising on fresh matters (85 percent of tonnage); (5) Florida Tangerine Cooperative, promoting zipperskin fruit only (representing over 60 percent tangerines); (6) Indian River Citrus League, advising and promoting Indian River area citrus (all Indian River shippers).

I would only attempt to outline the Florida marketing structure for your consideration. I hate to admit it, but none of these marketing programs has been proven a definite success, nor has any been proven a positive failure. There seem to be substantial changes in current thinking of how growers will market their fruit in Florida. Most far-thinking or well-informed growers, after using all the mechanisms of State promotion, freezing as a crutch, cash buying, and government help have come to the conclusion that only through strong grower-owned or grower-oriented marketing organizations can they continue to look ahead to grower prosperity.

The Florida citrus industry is rather awesome in size and in potential production. This season, in Florida, we will produce about 185 million 90-lb. boxes of various types of Florida citrus. This will be the second largest crop in history. Basically, it will all be sold for more than cost of production; oranges, which are the large part of this production, will sell for very nice profits, based on State average production and current prices. The Florida crop is marketed by 20 concentrators, 30 canneries, 10 chilled juice operations, and 150 fresh fruit packing houses.

Perhaps part of this organized marketing structure is owing to the fact we have a potential of over 75 million 90-lb. boxes of increased production now in the ground, which will be offered for sale over the next 5 to 7 years. As close as we can figure, without an increase in new plantings somewhere about 1975-76, we will produce 250 million boxes of Florida citrus, and I'm sure if prices remain reasonably good, this is too conservative.

The most organized part of Florida citrus today lies in the processed side of the business. Some 60 processors are using 155 million boxes, or 80 percent of the Florida citrus crop. Today over 80 percent of this processed fruit is moving to the processor on some type of handle, participation, or member basis, with the remaining 20 percent bought on the cash or spot market. Therefore, the obligation of processing, storing, financing, and marketing today is largely borne by the growers.

Florida growers have found that over a period of years they can better prosper by financing and taking the risk rather than releasing their fruit through cash sale at harvest time.

Contracts for fruit handling and marketing can be divided about as follows:

(1) Grower cooperative contracts.--These operations usually involve an average operation of 1 to 15 million boxes of citrus. Plants are integrated fully with regard to facilities for making concentrate, chilled juice in glass, single strength juice, feed, oils, and other products. Many integrated plants are large fresh fruit packers. Grower investment ranges from 1 million dollars to as high as 10 million dollars in plant facilities. These co-ops have, as a rule, a 10-year contract with cancellation clause on an annual basis, 30 days prior to the annual meeting. Grower equity is usually brought about through capital retain certificates collected in advance, or on a per box basis as fruit is handled. This cooperative volume would represent 55 percent of the Florida industry. Bank of Cooperatives figures strongly in financing through facility, operating, and inventory loans.

(2) Grower participation plans.--In this instance independent growers sign a contract to deliver a certain amount of fruit to a processor over a given span of time. There are many varied formulas involved in such a contract. This would perhaps equal 25-30 percent of the State's production. Within the grower participation program we have much diversity in thinking and in contract terms. Also, there are two sizable and very well supported grower cooperatives which own no production facilities but function really as bargaining cooperatives between the growers and the independent marketing company which they select as their marketing agent. I refer to Florida Orange Marketers marketing through the Minute Maid Division of Coca Cola Foods and West

Coast Growers marketing through Lykes-Pasco Corporation. Each has several hundred growers. There are several other smaller groups which operate in much the same manner.

The balance of the grower participating programs is strictly straight-line grower-processor or packer participation agreements. Here again, most of these contracts are written with long range marketing commitments in mind but subject to annual cancellations with prior notice.

Most of the marketing contracts in grower cooperatives spell out returns based on total sales minus total costs, with variances and corrections for retain structures. However, grower participation programs vary considerably depending on the varieties, guarantees, and size of crop. The tendency to change these participation programs depends largely upon the fruit demand. New contracts written in large crop years naturally do not include fringe benefits allowed for grower contracts written in short crop years.

Participation programs are usually the fringe area contract whereby an independent grower and independent processor each feel they are gaining some of the advantages offered by a true grower cooperative and yet keeping some of the privileges each desired as an independent operator.

Practically all grower contracts are written with a penalty clause. Usually this amounts to 50¢ per 90-lb. box--sufficient to "bind the contract" unless very unusual marketing circumstances arise. None is written without at least a 25¢ penalty for non-delivery.

Most grower participation contracts involve: (1) Specified number of boxes of fruit over a particular length of the season; (2) advances on fruit receipts ranging from picking and hauling upon fruit delivery to percentage payoffs based on sales. These determinations are usually made upon statistics furnished by the Florida Canners Association. For example, a standard procedure for a participation plan for a grower might be as follows:

You deliver 20,000 field boxes of oranges on participation. You might well be advanced 60¢ per box for harvesting upon delivery. In 3 months the canner's average indicated 25 percent of the State's product was sold. You would receive additional payouts based on this figure. Again, additional amounts in 6 months, 9 months, and 1 year, based on canner average percentage of crop sold. Other programs advance in a similar manner but charge interest on advance payouts.

Usually terms of participation programs involve set percent allowances for administrative and for marketing expenses. They generally figure about 4 percent for administrative expense and 5 percent for sales remuneration. Most programs guarantee a maximum cost of manufacturing so that the grower knows what expenses to expect. Some programs call for a "payout" to growers on a monthly sales basis. Others are on a pool basis, not to exceed 30-45 days after completion of pool sales, which could take from 9 to 12 months for complete payout of a given pool on a given variety. Naturally, the whole marketing system in Florida involving grower cooperatives or participation is to establish an obligation for the grower to stand almost all the market fluctuations and cost of processing his product.

About 20 percent of the State's production is sold on the cash market--some in advance; some on a daily market.

At one time harvesting was averaged as an expense. However, since almost every grove is arbitrated as to picking rates this is now a consideration only between grower and his harvesting agent and is no longer capable of being a pool averaged figure.

At one time, in Florida, most independent processors believed the ideal "mix" in fruit supply was one-third company production and one-third each from cash procurement and participation. Cash procurement has become hazardous and seemingly unpopular generally to both grower and processor. Either processors paid too much for cash purchases or bought too cheaply to satisfy growers and then took substantial profits through market changes and supply shortages. We now face a peculiar market situation, such that in times of short supply grower cooperatives may become cash sellers, when fruit supplies become too lean to supply the cash processor and his cash offer exceeds prospective season averages.

Most grower cooperative marketing programs are very similar. Where fresh operators do not have their own facilities they band together and sponsor their own processing operation. A good example of this is our company where 43 fresh fruit packing organizations are affiliated with 6 processing operations, 5 cooperatives and 1 independent plant.

Participation plans have similarity in language and intent as to quantity, quality, delivery, title, and various Act of God clauses. Plans include method of payment, basis of payment, and how profit sharing (if any) will be divided.

There have been many differences of opinion in some participation programs. Some growers took too much for granted, giving first priority to their own fruit in an emergency such as following a freeze. Some growers have not recognized that different citrus varieties in Florida have different values for use as fresh fruit, chilled juice, or concentrate.

Most participation programs use one or more of the following criteria for basis of payments of pools: (1) Florida canners average--a price derived from voluntary confidential information supplied to the Florida Canners Association showing average prices sold on a weekly basis over the season; (2) spot average price--all processors report purchases at cash market for a given week (not very typical of value today, since it involves less than 20 percent of the fruit sales in the State); (3) a combination of spot cash, contract in advance, and tree-crop estimated price (a percentage of each is averaged in to obtain a price); (4) average f.o.b. selling price of product (the most popular method of determining returns today--price cards of 3 to 5 leading processors are frequently used as the guideline); (5) payoff based on price cards of leading processors for specific periods of time, not a season average; (6) additional pay-back to the grower from profits of byproducts, such as oils or feed. (Since we market everything but the "squeal," this can in some years be a factor in determining additional returns between a share factor and a keep factor in a participation program and may average as much as 5-6¢ per box.)

Many large growers in Florida will have their various holdings in more than one cooperative or participation program because of geographic location or special marketing ability for a particular variety by a particular company. Some are stronger in concentrate; others in fresh or chilled.

Harvesting today has become a dominant factor in affecting marketing affiliations. Every major marketing organization in the processed industry and fresh fruit operates its own harvesting or negotiates with contract crews. Harvesting has reached or perhaps overreached the critical stage. Some growers actually make marketing contracts with one or more participation programs or more than one cooperative simply to assure harvest of the crop.

Change in marketing procedure has been slow in Florida, due to two rather severe freezes during the last 10 years. However, the movement toward centralized marketing is approaching rather rapidly. One of the most interesting processed integrations is the Citrus Central formation. This cooperative became the marketing arm for Golden Gem Growers and Plymouth Citrus Products Cooperative. It represents a volume of 20 million boxes of citrus in canned, frozen, and feed products, and byproducts.

My company sells their chilled juice since it is bought in many instances by the produce division of the retail trade.

Citrus Central has obtained two can manufacturing plants where they are enjoying a very profitable manufacturing operation. Florida Citrus Canners Cooperative has joined with them in this venture, thereby offering a raw fruit supply of 30 million boxes to support the can manufacturing plant. Profits will be excellent this year. The close alliance of this group has just been instrumental in its purchasing the Bordo processing plant, making it the largest processing group in Florida.

Our company, which has been in business as the Florida Citrus Exchange for 60 years, has changed its name to Seald-Sweet Growers. We have an aggressive solicitation program in progress, which has resulted in 7 new packing house affiliations. Our volume of fresh fruit, we believe, will be in excess of 25,000 cars next season, or 40 percent of the State's movement.

We are now marketing agents for one chilled juice and three chilled section and salad plants, thus increasing our processed citrus sales volume to about 1,500 car equivalent. We believe our share of the Florida fresh citrus market will grow to over 50 percent the next several years. At present we market for 43 packing houses.

Our marketing contract with our member houses is a 10-year contract, with cancellation clause on an annual basis, 1 month prior to our annual meeting. When our board of directors meets, there is a representation of over 60 million boxes of citrus involved, giving our organization a much stronger position of influence in State citrus matters than just our fresh supplies would indicate. Our sales charge with this volume is 8¢ per 40-lb. carton.

Looking to the future we can see nothing but vast crop increases ahead, which will require more mergers and more integrated marketing efforts to successfully market our expanded crops. The potential, without disaster, of 250 million boxes of Florida citrus with acreage now in the ground will speed the process.

This industry, in looking even beyond this stronger marketing pattern, has passed a grower referendum to promote and attempt to establish a school feeding program. The growers and shippers gave a 90 percent affirmative vote to tax themselves 5¢ per 90-lb. box to create a fund to allow a war chest for getting into convenient packaging and distribution of orange juice to the schools. This would be predicated on Section 32 Surplus Foods Purchase by the U.S. Department of Agriculture. The current thinking would be for the Florida Citrus Commission to collect and act as dispersing agent in this program, do research, and assist the schools and U.S. Department of Agriculture. We would hope ultimately to move 25 million gal. of concentrate.

We also have numerous tri-party promotion programs, whereby the Florida Citrus Commission, the Foreign Agricultural Service, and the customer each participate in a $2,700,000 advertising program. This is all being spent in Europe with 33 customers. While this has nothing directly to do with organizational patterns or marketing, it does reemphasize the need for larger, more integrated marketing operations to efficiently back up this program.

The trend in Florida is definitely very strong toward the grower cooperative in fresh and processed citrus. Participation operations are continuing to grow. However, as crops grow larger, independent companies continue to review their programs, thereby making them less attractive than previously written contracts. More integration and larger marketing cooperatives are definitely the Florida trend.

Cash buying as a method of crop procurement continues to decline in volume each year. Actually, short flurries of activity during reduced crop years become noticeable, but there is every indication that it is not growing. With the growth of the cooperative marketing agent, the manufacturing of supplies is growing. The feeling, of course, is to attempt to get every profit for the grower that is possible. If manufacturing cartons, can boxes, or cans is a profitable venture, Florida cooperatives will grow in this manufacturing themselves.

In closing, let me say we are proud and thankful for a citrus business which has been profitable in the past. Some in Florida say we are committed to more acreage and production than we can profitably market. I honestly don't believe this to be the case. In 1910, we faced a marketing crisis with 10 million boxes of citrus. Now, in 1969, almost 190 million boxes have been successfully marketed; in 1979, perhaps 275 million boxes. Grower involvement in every phase of this citrus growth, in partnership with independent capital or through grower cooperatives, will be a key to prosperity in this growing industry.

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